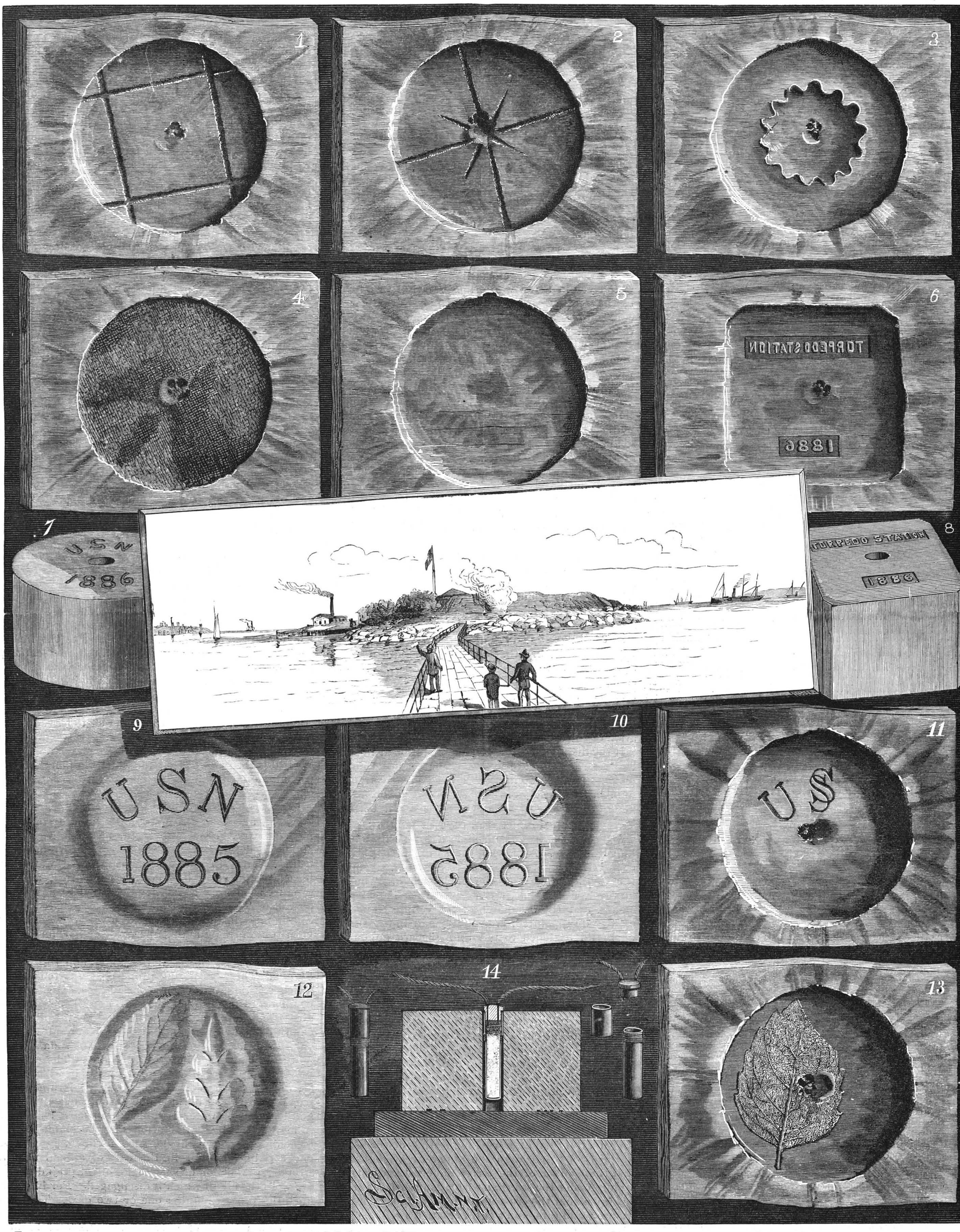
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1887, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LVII.--No. 15. [NEW SERIES.] | NEW YORK, OCTOBER 8, 1887. | [$3.00 per Year.



EXPERIMENTS WITH DETONATING GUN COTTON AT THE U. S. TORPEDO STATION, NEWPORT, R. I.—VIEW OF THE STATION.—[See p. 230.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S. or Canada.............................$3 00
One copy, six months, for the U. S. or Canada.............................1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of *seven dollars*.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information. (2) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies, 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, OCTOBER 8, 1887.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 614.

For the Week Ending October 8, 1887.

Price 10 cents. For sale by all newsdealers.

THE TOTAL ECLIPSE OF AUGUST 19.

The weather in the European region of the path of totality of the solar eclipse was all that could be asked for during several weeks previous to the coming of the eventful day. The sky was cloudless, the atmosphere pure and dry, and the conditions were perfect with the exception of a few passing storms. A few days before the eclipse, there came a change; violent storms raged, and a center of barometrical depression held sway over western Europe. On the morning of the 19th, a thick veil of clouds extended over the whole European line of the central eclipse, and concealed the glorious spectacle from sight, except in a few instances through breaks in the clou . Words are powerless to express the disappointment of the enthusiastic observers stationed on the route or the loss to science caused by the intervention of the unwelcome clouds. A few glimpses of the contacts were obtained, the spectroscope was successfully used, darkness reigned during the period of totality, the clouds took on brilliant hues, and some adventurous Russian astronomers mounted in balloons above the clouds to behold the grand phenomenon.

An observer in Elpatievo Narischkine, in the Russian province of Vladimir, the town being in longitude 35° 17′ east of Paris, and in latitude 56° 57′ north, gives a graphic narration of his own experience in a letter to the editor of *L'Astronomie*. We translate it for the simplicity and vividness of his account of the superb spectacle, and for his exceptional good fortune in beholding it.

19 Aug. 1887, 8 h. A. M.

M. LE DIRECTEUR:

The weekly courier starts in five minutes. I hasten to tell you in a few words how greatly I was favored by the weather, which was frightful last evening. The clouds broke away, and the sun shone only from the time of the commencement of the eclipse to its close. This is what I observed according to local time. I used a Bardou refractor of about three inches aperture, with an eyepiece magnifying twenty-five times. The telescope was ordered for this special use.

At 5 h. 45 m., local time, the sun emerges from the clouds, and presents on its surface two spots of small extent. The first contact takes place at 5 h. 53 m. At 6 h. 18 m., the first or western spot is touched by the border of the moon; at 6 h. 27 m. 30 s., the second spot is covered. The second contact takes place at 6 h. 52 m. 31 s. Immediately I perceive four rosy protuberances, producing a wonderful effect, placed respectively at 100°, 180°, 220°, and 240°.

They are the only ones I see, deeply impressed as I was by the unheard-of magnificence of the spectacle. The silvery corona of the sun far surpasses any idea I had formed of its exceeding beauty. Those who surround me are full of emotion, and an entire silence reigns over the country. I see two stars. The one at the zenith is Regulus, the other is Mercury, in a straight line between Regulus and the sun.

At 6 h. 54 m. 45 s., a ray of light flashes from the sun, we draw a long breath, everything resumes its course in the suspended life of terrestrial nature. The western spot reappears at 7 h. 18 m. 30 s. The second spot is seen at 7 h. 28 m. Finally, at 7 h. 53 m., the last contact takes place, the clouds resume possession of the eastern sky, and there is every prospect of the continuation of the unfavorable weather.

If the distinguished astronomers stationed in Russia had been as fortunate as I was, the science that you make so popular would have gained greatly from the number and variety of the observations made.

H. URECH.

THE HUMOROUS SIDE OF THE ECLIPSE.

A spectacle as awe-inspiring as a total eclipse has its humorous side. At Berlin, the sun rose eclipsed, and eclipse trains were organized to enable the people in the vicinity to behold the phenomenon. The sky, however, at the time, was covered with impenetrable clouds, and the occupants of the eclipse trains were greatly disappointed. A countryman in the suburbs of Berlin hastened to put up a placard announcing that, on account of the bad weather, the eclipse would be put off until Sunday.

The governor of Moscow, knowing the ignorance of the people over whom he held sway, issued the following circular, which was distributed through the whole province: "The *moujiks* must not be frightened if, a few moments after the eclipse, they see falling from the sky a round mass supporting men. This mass, called a balloon, has been made use of for carrying astronomers high enough in the air to enable them to study the eclipse without being prevented by the clouds."

M. FAYE, the well-known French astronomer, has drawn attention at a recent meeting of the French Academy of Sciences to the apparent geological law that the cooling of the terrestrial crust goes on more rapidly under the sea than with a land surface. Hence he argues that the crust must thicken under oceans at a more rapid rate, and so give rise to a swelling up and distortion of the thinner portions of the crust, in other words, to the formation of mountain chains.

Zinc Etching.

A zinc plate having a smooth polished surface is taken, and upon it is drawn the required design with an ink composed of asphaltum, turpentine, and oil (enough to keep the composition in a liquid state), and a little lampblack to darken it. Or, if the object to be reproduced be an engraving, either stone, plate, wood, or any other material, it is transferred by the usual mode; that is, by taking an impression from the engraving on "transfer paper," and thence to the zinc plate.

The transfer ink used is a compound of ordinary lithographic printing ink and asphaltum, in the proportion of about one-third of the latter to two-thirds of ink. The drawing or transfer having been completed, and before the ink has become dry, it is covered with a coat of powdered resin or copal, the back of the plate being also coated with asphaltum to render it acid proof. The plate is now ready for the bath, which consists of muriatic acid of about 1·2 specific gravity (or other suitable acids either in their pure or diluted state, such as nitric acid, etc.), where it is allowed to remain about five seconds. It is then taken out, washed, dried, and, when dry, heated only enough to melt the powdered resin or copal, so as to form a crust which will protect the edges of the drawing or transfer which has been formed by the first exposure of the plate to the etching agent. The plate is next returned to the bath of muriatic acid, again allowed to remain about five seconds, and washed and dried once more. Those portions which are high enough to print are then covered with asphaltum, and another coat of powdered resin or copal is added, after which it is replaced in the bath and allowed to remain until sufficient depth is obtained on the exposed parts. These operations of covering the plate and returning to the acid may have to be repeated three or four times, according to the nature of the work. The plates used are, of course, restricted to such metals as are affected similar to zinc.

New Process for Tin Plates.

A patent has been recently granted to Mr. William H. Brown, of Jersey City, for a novel process of manufacturing continuous tin plates. The plates in question are made of steel, and the process consists in producing a sheet of steel of any continuous length and of required width by first rolling the metal hot and afterward rolling it cold, until a proper thickness and perfectly smooth surface is obtained. Next, the surface of the sheet is scoured, and then it is afterward passed through a bath of molten tin, thus receiving its coating. Finally, the sheet is subjected to a rolling operation, under heavy pressure, between highly polished rolls, by which the tin and steel are condensed and consolidated together, and the surface hardened and polished. The inventor states that by this method the tin will be found to be so hardened upon and incorporated with the steel as to produce a tin plate which is superior in most respects to any tin plate wherever produced, and which, owing to the homogeneous molecular structure of steel, differs essentially from any tinned iron plate, because the fibrous structure of the iron would render it impossible to subject it, after tinning, to such a heavy rolling as is here employed without it working its fibers into or through the tin in such a manner as to leave the tin very thin in some places, or breaking through it entirely. The purpose to which these plates are to be applied is the same as that for which tin plates are at present employed—namely, roofing, tinware, etc.

A New Bleaching Process.

Messrs. Jacobson Brothers, of Berlin, are stated to have discovered a new process for bleaching vegetable and animal fibers, which is likely to prove of great utility. Hitherto the use of oxygenated water for bleaching purposes has been very limited, as this product soon loses its efficacy if carried to any great distance. The inventors found that oxygenated water can, in most instances, be replaced with advantage by baths obtained by adding peroxide of barium to the solution of certain salts. The peroxide of barium is decomposed very slowly in the water, and throws off oxygen. These decoloring properties imparted to the saline solutions are, to a considerable extent, independent of the nature of the salts, and the most favorable results are obtained with alkaline silicates, the chloride of ammonium, and the alkaline borates. The chloride of magnesium and phosphate of soda act less powerfully, and still less the sulphates. The proportional weight of the salts, and the water in which they are dissolved, vary considerably, but a mixture of one part of peroxide of barium, one part of silicate of soda, and 100 parts of water is sufficient in most instances. A more concentrated solution may be employed for bleaching vegetable fibers, such as linen, jute, rags, paper pulp, etc., but in the case of animal fiber a stronger proportion of silicate might act prejudicially, owing to the alkali which is disengaged. For jute and linen the process requires one or two days. The peroxide of barium may be mixed with the silicate solution, or a mixture of pulverized peroxide of barium and silicate may be dissolved in water.

PHOTOGRAPHIC NOTES.

Treatment of Mixed Hypo and Alum Baths.—At the convention of photographers held in Chicago, Ill., last August, President Cramer made the following interesting remarks about the development of dry plates in hot weather and the proper method of mixing the hypo and alum baths:

He says: "In preparing the developer, dilute the alkali solution with half its quantity of ice water, from an ice cooler. After the plate is developed, to prevent filling, do not wash it under a stream of water, but place it in a dish, then change the water a couple of times and press it to the hypo solution. All danger of filling can be avoided by using a strong dose of alum in the bath, as much alum as hypo. The alum will tan the gelatine until it is almost as hard as sole leather, after it is thoroughly fixed; so hard that you can barely scratch the film off the glass with your finger nail.

"Such a bath with a large amount of alum will naturally fix a little slower, but it will be an advantage to leave the plate in a little longer, because the film will be rendered more insoluble thereby. If the plate is left in long enough, you can take it out and wash as long as you please. It will be sufficiently tough and hard to stand the water in any climate, even in tropical countries."

Referring to the white precipitate which usually occurs when the two chemicals are mixed, he continues: "The precipitate is formed of sulphur and alum. This should be allowed to settle until the solution is clear, before the bath is used. An addition of bicarbonate of soda prevents further precipitation. For example, two pounds of hypo and half a pound of bicarbonate of soda are dissolved in one gallon of water, which is then mixed with another gallon of water having in it two pounds of powdered alum previously dissolved, making a total of two gallons of fixing solution.

"This addition of bicarbonate of soda seems to keep the solution clear for a long time."

Function of Sulphite of Soda in the Pyro Developer.—In regard to this, President Cramer said: "It has the beneficial effect of preserving the pyro from decomposition. Pyro is a substance that has great affinity for oxygen. An aqueous solution of pyro will soon decompose, as the pyro absorbs the oxygen which is contained in the air and water. The addition of sulphite of soda will retard this decomposition, because the sulphite has great affinity for oxygen.

"Besides this beneficial effect of preserving the pyro from decomposition, it also prevents the yellow color which would be produced if pyro and alkali were alone used. Pyro with sal soda or carbonate of potassium, without sulphite, will make negatives as yellow as a lemon. If you add sulphite, you will observe the yellow color decreases in the same proportion as you add more sulphite. If you add four parts of sulphite of soda to one part of carbonate of soda, you will have no yellow color to speak of, but a gray negative that resembles the collodion negative of former times.

"It is necessary to use pure sulphite of soda and to keep it in bottles tightly corked, as it is liable to become converted into sulphate of soda.

"Dry pyro is used by many operators, but the solution is more convenient and accurate. I have found from experience that sulphurous acid is the best preservative for pyro. I have prepared solutions of pyro in water, with the addition of several acids, to note their respective preservative qualities, and have put them on the shelf for a long time.

"After a couple of months, I found all solutions changed materially. The one with sulphurous acid kept best of all. I have found it is not easy to get sulphurous acid from any drug store. It had no odor at all. Sulphurous acid should have a very strong odor, the same as a burning match. I recommend the preparation of sulphurous acid by each individual. It is quite simple, and is performed as follows: If you add sulphuric acid to a solution of sulphite of soda, at first no odor will be perceptible, as sulphite of soda contains a small amount of carbonate which has first to be neutralized before any sulphurous acid is liberated, which manifests itself by the peculiar odor already described.

"I recommend the following solution: To six ounces of water add fifteen minims of sulphuric acid and one drachm of sulphite of soda in crystals. After dissolving, add one ounce of dry pyro."

New and Valuable Antiseptics.

Prof. Wm. Thomson, F.R.S. (Manchester), has contributed a paper to the British Association on the "Antiseptic Properties of Some Fluorine Compounds." He said that some time ago he was engaged in trying to find a substance which would act as a powerful antiseptic, etc., which was not volatile, and which was not destroyed by oxidation. He tried the effects on flour paste and on meat chopped into small pieces and mixed with water, of a very large number of chemical compounds, and found that those which had the most remarkable antiseptic properties were the compounds of fluorine, hydrofluoric acid, the acid and neutral fluorides of sodium, potassium, and ammonium, and the fluosilicates of those bases. Of these compounds, he found sodium fluosilicate to be the one which for its powerful antiseptic and unobjectionable properties was the one which for the general purpose of an antiseptic was perhaps the best suited.

This body was not poisonous, possessed no smell, and was sparingly soluble in water. It had only a very slightly saline taste, and might be therefore employed in preserving food without communicating any taste to it. Many experiments had been made with it for surgical purposes. A saturated solution which contained 0·61 per cent of the salt was not irritating to wounds, while it possessed greater antiseptic power for animal tissues than 1 part of perchloride of mercury in 1,000 of water, which was a stronger solution than that which could be generally employed for surgical purposes without producing poisonous effects.

It was suggested that the antiseptic under consideration might be of great value in sewage irrigation, provided it had no injurious effect on vegetation. Prof. Thomson said his own experiments showed that sodium fluosilicate did not destroy grass so rapidly as common salt. He had been told that the substance removed unpleasant smells from the hands, and a solution of it would, therefore, be useful for medical men after performing objectionable operations. Sodium fluosilicate could not be obtained in a concentrated solution. It dissolved slowly, but the small quantity thus obtained was a powerful antiseptic and deodorizer.

Some Electrical Fishes.

A lecture on "Electrical Fishes" was delivered at the Royal Institution several weeks ago, by Dr. Burdon Sanderson, who has had the opportunity of studying the physiology of the "torpedo" fish during a recent visit to the shores of the Bay of Biscay. With a view of making his subject more interesting, the lecturer not only gave the results of his research, but also compared the physiological structure of the torpedo (*Torpedo vulgaris*) with those of *Malapterurus electricus* and *Gymnotus electricus*, while the Zoological Society had placed a fine living specimen of the latter fish at his disposal during the evening. It was with a fish of the latter type that Faraday experimented, and found that the strongest shocks were obtained by touching the fish simultaneously at the head and tail, while scarcely any effect was observed on touching each side at the same distance from the extremities. He calculated that at each medium discharge the animal emitted as great a force as the highest charge of a Leyden battery of fifteen jars exposing 3,500 square inches of coated surface.

The gymnotus, or electrical eel, is common in the tributaries of the Orinoco, and is generally captured by causing the fish to expend their shocks upon horses driven into the stream, until exhausted, when they become an easy prey. The electrical organs form more than half the body, and consist of four batteries, two on each side, one above the other, the uppermost or dorsal being the larger. These batteries consist of a series of parallel piles placed horizontally in a direction from head to tail, each layer consisting of protoplasm upon the upper and nerve upon the lower surface, and these are again subdivided by transverse sections.

In the malapterurus, a genus of fishes of the family *Siluridæ*, the whole animal is clad in a tegument of dense tissue, which in this case constitutes the electric organ and is connected with the nervous system by one large nerve. It is remarkable that the natives on the Congo use the same word for the name of both this fish and the telegraph. The torpedo, which is allied to the skate, and varieties of which are found in the Mediterranean, Atlantic, and Indian seas, differs from both of the former in possessing a special brain, or rather a special lobe of the brain, termed the "electrical lobe," which is situated behind the cerebellum, and has control over the electric organs of this fish. These organs are divided by means of a number of vertical columns, about five hundred in an ordinary specimen of the torpedo, although in the case of one caught off the coast of the United States, 5 feet in length and 12 stone in weight, one thousand of these columns were observed. The divisions between the columns are again subdivided into compartments presenting a honeycomb appearance, and to each of these compartments five nerves are attached, so that in a medium sized fish some twelve thousand nerves are employed in the electric organs.

Dr. Sanderson gave a very elaborate description of the arrangement of the nervous system in the torpedo, showing how the large nerves pass along the vertical columns, sending out branches to each of the cells on either side, the nerve invariably passing along the lower side of the cell wall. Throughout the lecture Dr. Sanderson illustrated his remarks by photographed sections of the parts under discussion thrown upon a screen, but at this stage some very fine microscopical slides were projected, the results of the lecturer's recent work. These slides not only illustrated the general arrangement of the nerves, but, descending into further detail, showed that the principal nerves were sheathed, while the smaller ramifications were not, while at the end of the nerve there was no complex structure observable, but a simple termination.

Having thus brought before his audience the least technical of his observations, Dr. Sanderson proceeded to discuss the origin and use of the electric organs in fishes. In most cases the initial development of the electric organs is similar to the development of muscle, but in the malapterurus it is not the muscular system which is transformed, but the skin, glands, and other parts connected with the skin.

The lecturer raised the question as to why fishes had been provided with such a weapon of attack or defense. In the case of the torpedo, has the torpedo degenerated into the skate through not making use of its electrical organs, or is the skate the original form of the torpedo? Both hypotheses seem unstable, as it hardly seems probable that a fish would cease to make use of such a useful adjunct as electricity in procuring food, or that it should by any circumstances develop an organ of which there is no sign in the original, although some naturalists assert that in the tail of the skate there is a development which may allow of such a possibility. Dr. Sanderson, however, thinks it quite as probable that the electric organ should be formed from the muscular system as the muscle formed from the electric organ, and prefers to consider that they both have their origin in a simpler element. If such be the case, by what steps have these organs progressed in their development from the original matter? The lecturer expressed an opinion that most probably an answer would be found to this question in an exhaustive microscopic examination of the nerve. Looking at it from the physiological side, the only difference between the muscles and the electric organs is that one is supplied with motor nerves, the other with electromotor nerves.

Another remarkable fact recently observed by Dr. Sanderson, to which he drew attention, is that two kinds of shocks are experienced in experimenting with electrical fish. Thus, when a fish is suddenly touched or attacked, a sharp explosive shock is felt, but the more normal effect is a prolonged series of smaller shocks of inferior intensity. The lecturer made this point very apparent to his audience by touching the specimen of gymnotus present simultaneously at the head and tail with two wires connected with an electro-magnet, when the shocks delivered were made perceptible by the movement of a paper lever, the shadow of which was thrown upon the screen. The chairman was even more favorably situated, as he was enabled, by means of a telephone, to hear the distinct shocks produced.

Dr. Sanderson also gave the results of a series of experiments conducted with regard to the measurement of the period of time elapsing between the "exhortation" of the fish and the delivery of its shock, and also concerning the duration of the shock. He found that after a sudden attack, one-hundredth of a second elapsed before the primary single response to the exhortation was obtained, the discharge reached its maximum power one five-hundredth of a minute after its commencement, and had a duration of about one-fourth of a second. On continued irritation, a number of smaller shocks were received, recurring at intervals of about one-fiftieth of a second.

Transplanting Nut Trees.

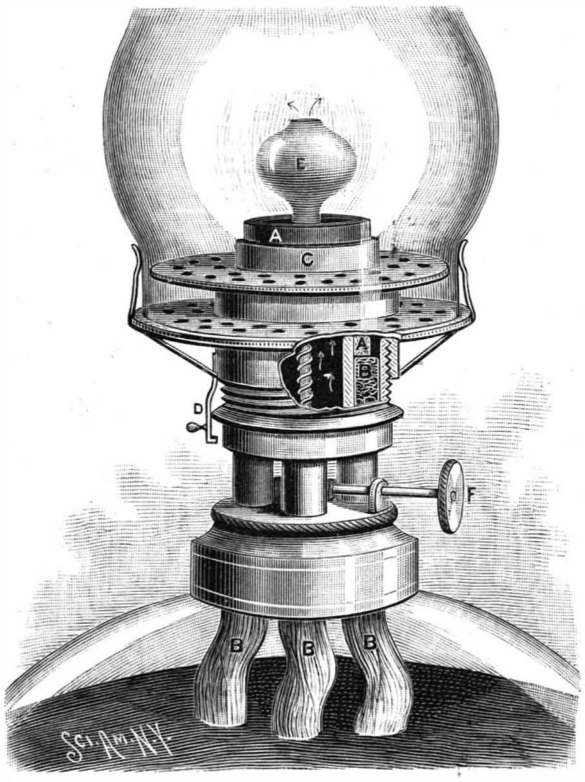
D. B. Weir, of Marshall, Ill., offers his own experience to disprove the theory that has been advanced by various writers for several years, to the effect that in raising nut-bearing trees they are liable to be lost by transplanting. He states that during the past twenty-four years he has transplanted thousands of black and white walnut trees, one, two, and three years old, with as little loss as he has met with in transplanting trees of any other hardwood variety. A year ago last spring, according to the *Northwest Lumberman*, he transplanted 10,000 one and two year black walnuts, late in the season, and in a careless manner, and though the following summer was quite dry, nearly every tree grew. Last spring he transplanted 3,000 trees two years old, also late, with as little labor as possible, in thick rows, and now, after one of the driest seasons ever known, nearly all are alive. Last spring, also, Mr. Weir sent some nursery stock, including 400 one year and 400 two year black walnuts, to Northwestern Iowa, where there has been scarcely any rain for two years. A report came back from the customer July 1, that the drought had killed all the trees except the 800 walnuts, every one of which was alive and growing nicely.

Flies as Disseminators of Tuberculosis.

A recent number of the *Gazette Hebdomadaire de Medecine et de Chirurgie* contains an abstract of an interesting communication to the French Academy of Sciences, on the dissemination of the tubercle bacillus by flies. They settle in great numbers upon the sputa of phthisical patients, become gorged with the bacillus, and then convey it to articles of food. The recommendation which the authors, Dr. Spillmann and Dr. Haushalter, found on these observations is that the sputa should be rapidly and thoroughly disinfected.

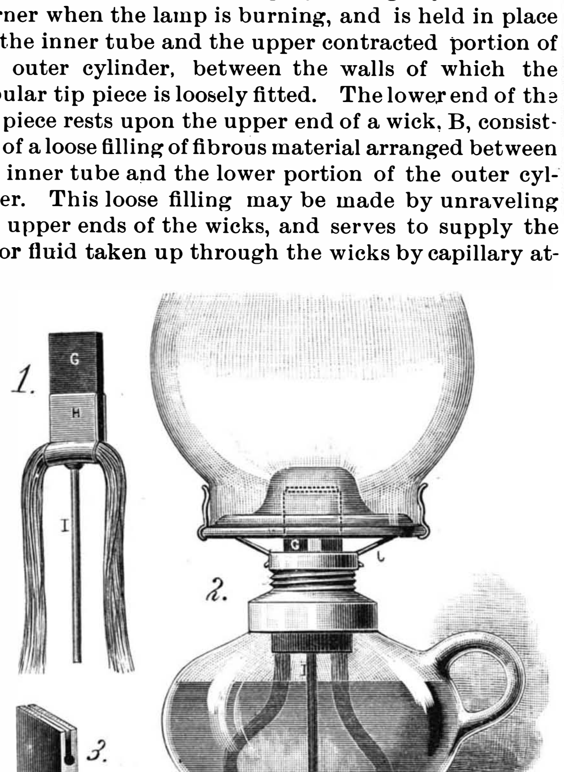
IMPROVED LAMP AND INCOMBUSTIBLE BURNER.

The accompanying illustrations show two forms of an improved lamp, in which the chief distinguishing feature is a compound wick, composed of an incombustible tip piece of mineral or refractory material and a cotton or other like fibrous or wick section, for feeding the burning fluid or oil to the tip piece. In the Argand or round burner form of lamp, the upper portion of the burner is connected with the cap which fits over the neck on top of the reservoir by three wick tubes, which admit air between them to the body of the burner, which is composed mainly of an inner tube, an outer cylinder, through the bottom of which the wick tubes communicate, and an upper adjustable cyl-



THE YANEZ ARGAND LAMP, INCOMBUSTIBLE WICK.

inder screwed on to the latter. The latter cylinder carries the shade, and air is admitted to the exterior of the flame through the perforated diaphragms, air being supplied to the inside of the flame through the inner tube, on top of which is a perforated diaphragm (not shown). Between the inner tube and outer walls of the burner is carried the compound wick, having a tubular tip piece, A, of bath brick, unglazed pottery, or other like porous material, which projects slightly above the burner when the lamp is burning, and is held in place by the inner tube and the upper contracted portion of the outer cylinder, between the walls of which the tubular tip piece is loosely fitted. The lower end of the tip piece rests upon the upper end of a wick, B, consisting of a loose filling of fibrous material arranged between the inner tube and the lower portion of the outer cylinder. This loose filling may be made by unraveling the upper ends of the wicks, and serves to supply the oil or fluid taken up through the wicks by capillary at-



THE YANEZ HAND LAMP, INCOMBUSTIBLE WICK.

traction to the porous tip piece, which by its absorption keeps the flame supplied with the necessary burning gases or vapors. The amount of flame is regulated by screwing or unscrewing the adjustable outer cylinder, C, thus more or less exposing the tip piece; or the flame may be extinguished by sufficiently screwing up this cylinder, a spring catch, D, preventing its being accidentally detached when adjusted to its extreme upward position. The bulb-shaped flame spreader, F, is hollow, and forms a passage for the supply of air to the interior of the flame. The bulb is readily adjusted up or down by the finger screw, F.

The hand lamp shown, which may also be constructed in other forms, has a tip piece, G, of similar material to that heretofore noticed, but is made in flat or rectangular form, as shown in Fig. 1. It is held in a clamp or holder, H, forming a pincers-like clip, with a transverse tubular construction at its base, through which a cotton or other like fibrous wick is passed, and which descends into the lamp reservoir to supply the oil or burning fluid by capillary attraction to the tip piece, G. The wick clamp or holder is supported by a rod, I, which rests upon the interior bottom of the lamp. The wick clamp is thus held at a fixed or given altitude, fitting loosely at the top within the wick tube. To regulate the flame, the burner, J, is turned to the right or left, to screw or unscrew its lower neck down or up within the fixed top of the reservoir, thus exposing more or less of the tip piece above the wick tube. Fig. 3 shows a modification of the tip piece, G, with a lateral slot and tubular opening through its upper part, which facilitates the gasification of the oil.

These improvements form the subject of two patents recently issued to Mr. Adolfo Sáenz Yañez, Jefe de Construciones Civiles, Inspeccion Gen'l de Obras Publicas, Habana, Cuba (Chief of Civil Constructions in the General Inspection of Public Works, Havana).

Those Grasping Railway Monopolies.

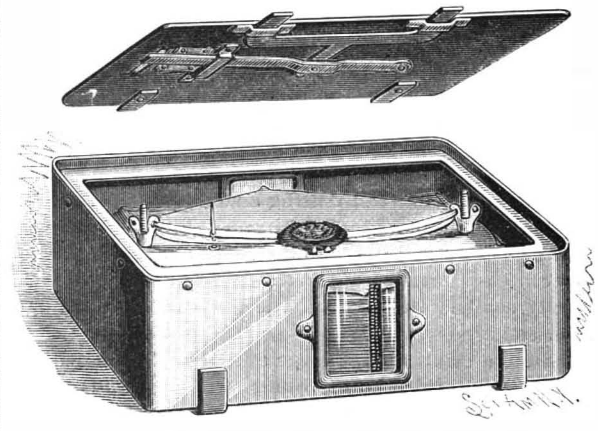
A magazine published in Philadelphia in 1818 gave the following as an item of news: "In the course of the twelve months of 1817, 12,000 wagons passed the Alleghany mountains from Philadelphia and Baltimore, each with from four to six horses, carrying from thirty-five to forty hundredweight. The cost of carriage was about $7 per hundredweight, in some cases as high as $10, to Philadelphia. The aggregate sum paid for the conveyance of goods exceeded $1,500,000." To move a ton of freight between Pittsburg and Philadelphia, therefore, cost not less than $140, and took probably two weeks' time. In 1886, the average amount received by the Pennsylvania railroad for the carriage of freight was three-quarters of one cent per ton per mile. The distance from Philadelphia to Pittsburg is 385 miles, so that the ton which cost $140 in 1817 was carried in 1886 for $2.87. At the former time the workingman in Philadelphia had to pay $14 for moving a barrel of flour from Pittsburg, against twenty-eight cents now. The Pittsburg consumer paid $7 freight upon every 100 pounds of dry goods brought from Philadelphia, which 100 pounds is now hauled in two days at a cost of fourteen cents.

A DEVICE TO KEEP VISE JAWS PARALLEL.

A simple device for securing perfect accuracy in the movement of the movable jaw of a vise, and which avoids the trouble of changing the adjustment by hand, is shown in the accompanying illustration, and has been patented by Mr. Edward D. Sloan, of No. 2102 Lafayette Street, Denver, Col. A fixed jaw is secured to the bench, and is curved at the upper end in the usual way, a similar movable jaw being swiveled opposite thereto by a screw, on the outer end of which is the handle for operating the vise. To the upper and lower cross timbers of the bench, near the rear, are pivoted levers which cross each other, a pin on one lever sliding in a slot in the other lever, the outer ends of these levers being connected with bars which extend through mortises in the fixed jaw, one bar being pivoted in the lower part and the other bar in the upper part of the movable jaw. By this means, when the screw is operated to carry the movable jaw in or out, a perfect parallelism of the jaws is maintained. This invention is especially adapted for vises used by wood workers, but may also be applied with iron vises.

A SAFETY PACKAGE FOR MONEY.

A box in which money in the form of bills can be placed and clamped so that none can be removed without breaking the seals, and so that the contents may be seen at any time, is shown in the accompanying illustration, and has been patented by Mr. Clarence R. Arnold, of Wellsville, Ohio. The box is made of sheet metal plates, their upper edges riveted to an inner strengthening frame, while to the bottom is attached a metallic frame made of a central bar and two cross pieces, the ends of the latter being bent up and riveted to the side walls of the box. From the center of each of these cross pieces posts extend upward within the box, the posts being threaded, and a clamping plate, apertured to fit over them, being held down upon a pile of bills, placed between the posts, by winged nuts. When the bills are so clamped, the bills being also impaled on a vertical needle screwed into the base if that be deemed necessary, a cord or ribbon is passed through the eyes of each of the nuts and tied and sealed on the clamping plate near its center. In each of the side faces of the box are small panes of tough glass through which the bills can be plainly seen, a pointer on the clamping plate registering with a scale on one of the panels. The small figure shows the under side of the cover, which has two fixed projections that fit under one of the side lengths of the frame, and a double-armed locking bolt arranged to be thrown outward and beneath the opposite side length of the frame, the operating lever for this bolt having an upward extension and connection on which is placed one of the seals used in fastening on the address tag. The advantages of a package of this kind, requiring no keys, and to use which no combination has

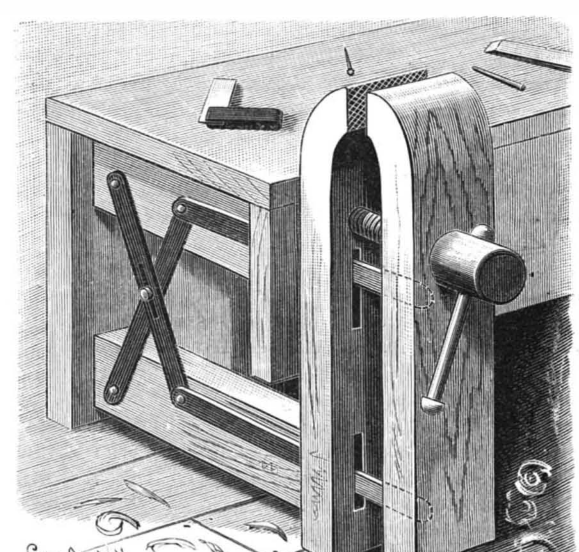


ARNOLD'S BANKER'S SAFETY EXPRESS BOX.

to be remembered, recommend its employment also for valuable papers, such as bonds, wills, etc., which are usually deposited in safes, the package affording only sufficient means of viewing its contents to obviate the danger of substituting other papers for those thus put under seal.

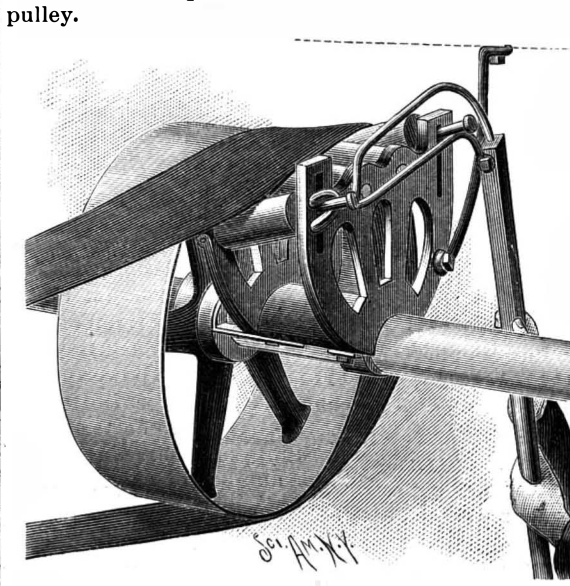
AN IMPROVED BELT SHIFTING DEVICE.

A device to be applied to a shaft near a pulley, to receive the belt when slipped off from the pulley and to facilitate the shifting of the belt back upon the pulley, is represented in the accompanying illustration, and has been patented by Mr. George H. Lowe, of Middletown, N. Y. A frame with a curved bearing and two side pieces, all cast in one piece, is held to the shaft near the pulley by a strap, and prevented



SLOAN'S VISE EQUALIZER.

from turning on the shaft by an arm secured to a support, or the device may be made fast to the hanger. Between the side pieces of the frame are centrally journaled two rollers, and on either side of them is hinged a rod carrying a tilting roller, the outer end of each rod passing through a slot in the side piece. The outer ends of these rods may be lifted in the slots, so that the tilting rollers they carry will lift the outer edge of the belt to cause it to run off from the rollers upon the pulleys, a handle with a rod bent to act as a fulcrum being employed for this purpose. The peripheries of the several rollers are arranged on a curve of the same radius as that of the pulley, so that a belt slipped from the pulley upon the rollers will be held upon the same plane with the circumference of the pulley.



LOWE'S BELT SHIFTER.

THE RACE FOR THE AMERICA'S CUP.

The first of this season's races for the America's cup, won last year by the Mayflower, sailing against the Galatea, occurred on Sept. 27, 1887. The cup was held by the New York Yacht Club, subject to challenge, and expecting one from some English yacht. On Sept. 22, 1886, the challenge came. It was received by cable message dated the preceding day, on behalf of Mr. Jas. Bell, and signed by William York, secretary of the Royal Clyde Yacht Club. Soon it was understood that a special boat was to be built for the contest. Several new yachts, therefore, were built here for the purpose of meeting the Scotch adversary. Previous races had made it perfectly clear that the English could build very fast boats, although they had always lost the America's cup races. The name of the intended competitor, the Thistle, was first divulged on Nov. 18, 1886, but all attempts to obtain a statement of her dimensions were futile, as the utmost secrecy was observed in her building and launching. The Shamrock and Titania, both of second-class size, were built in the belief that the Thistle would be about seventy feet in length. The disappointment of their owners at being excluded from the contest must have been very keen. It was only on March 29 of the present year that the general dimensions of the Thistle were known, when they were forwarded with the official challenge.

Mr. Burgess, the builder of the Puritan and Mayflower, believed that he could surpass both these efforts. He was accordingly engaged to model a new yacht to compete, if successful in the trial races, for the coveted trophy. On April 1, Gen. C. J. Paine, of Boston, gave Mr. Burgess the order for the boat, and Pusey, Jones & Co., of Wilmington, Delaware, contracted to build her. The work was done with the utmost expedition. She was launched on June 30, and three weeks later made her first trial trip. She was named the Volunteer, and was built of steel. The Thistle, also of steel, was launched on April 26, and sailed her first trip on May 12. In her building and launching the utmost secrecy was perserved, and at once the most marvelous stories of her speed began to appear. She sailed in fifteen races on the other side, winning eleven firsts, one second, one third, and twice not being placed. Thus her position was firmly established as the fastest yacht in England, the renowned Irex even having to acknowledge her superiority.

The Thistle left England July 25, and reached New York August 16, making a 22 days' run. The Volunteer spent the yachting season, up to the date of and after the arrival of the Thistle, in racing and cruising with other yachts, and it was generally acknowledged that she was by far the fastest boat in America A trial race with the Mayflower was sailed on Sept. 16, when the Volunteer appeared so distinctly superior that she was at once chosen as defender of the America's cup.

The Thistle and Volunteer were put in the dry dock before the contest, when the hulls of each could be examined by those interested. The Thistle appeared of very handsome model, but no reason for the secrecy maintained about her lines could be discerned. She is much wider than the typical English cutter, and has her forefoot very much cut away, probably to make her quick in stays.

The first race was won by the Volunteer. It was sailed under the following official measurements, according to the certificate of Mr. John Hyslop, the measurer:

	Thistle. ft.	Volunteer. ft.
Length for tonnage	96·5	92·58
Length over all	108 5	106·23
Length on water line	86·46	85·88
Breadth of beam	20·3	23·16
Depth of hold	14·10	10·90
Tons, old measurement	253·94–95	209·8–95
For time allowance	89·20	89·35

The Volunteer allows the Thistle five seconds.

The course was the inside course of the New York Yacht Club, from a point within the Narrows, down New York Harbor, to and around the lightship, and return, following the main ship channel. The length of the course is 38 nautical miles (about 42¼ statute miles). The Volunteer came in over twenty minutes ahead, averaging a gain of nearly half a minute per mile, representing at the average rate of sailing in distance gained per mile about 370 feet. The actual space separating the two at the conclusion was about 2½ miles.

The following is the official time:

	Start. H. M. S.	Finish. H. M. S.	Elapsed Time. H. M. S.	Corrected Time. H. M. S.
Volunteer	12:34:58¼	5:28:16¼	4:53:18	4:53:18
Thistle	12:33:06	5:45:52¾	5:12:46¾	5:12:41¾

The second race was set for September 29, but was postponed to September 30 for lack of wind.

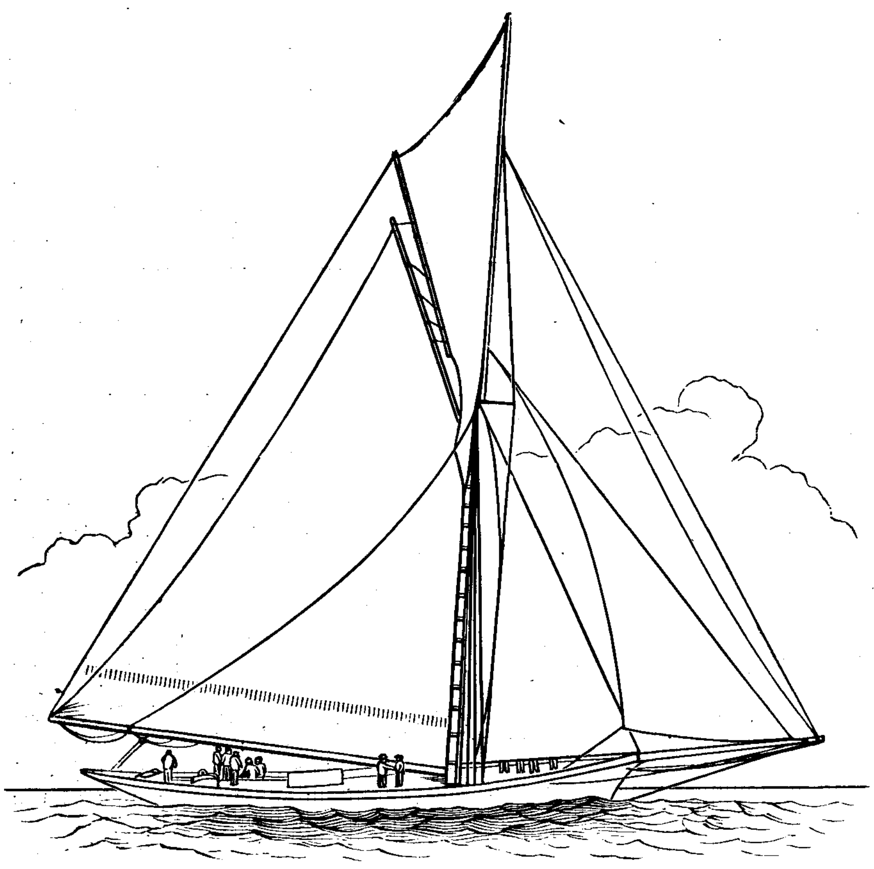
It was sailed on the outside, course twenty miles to windward and return.

It was won by the Volunteer by the superiority of her windward work. In the run home before the wind the Thistle gained nearly three minutes on her rival. The following is the official time:

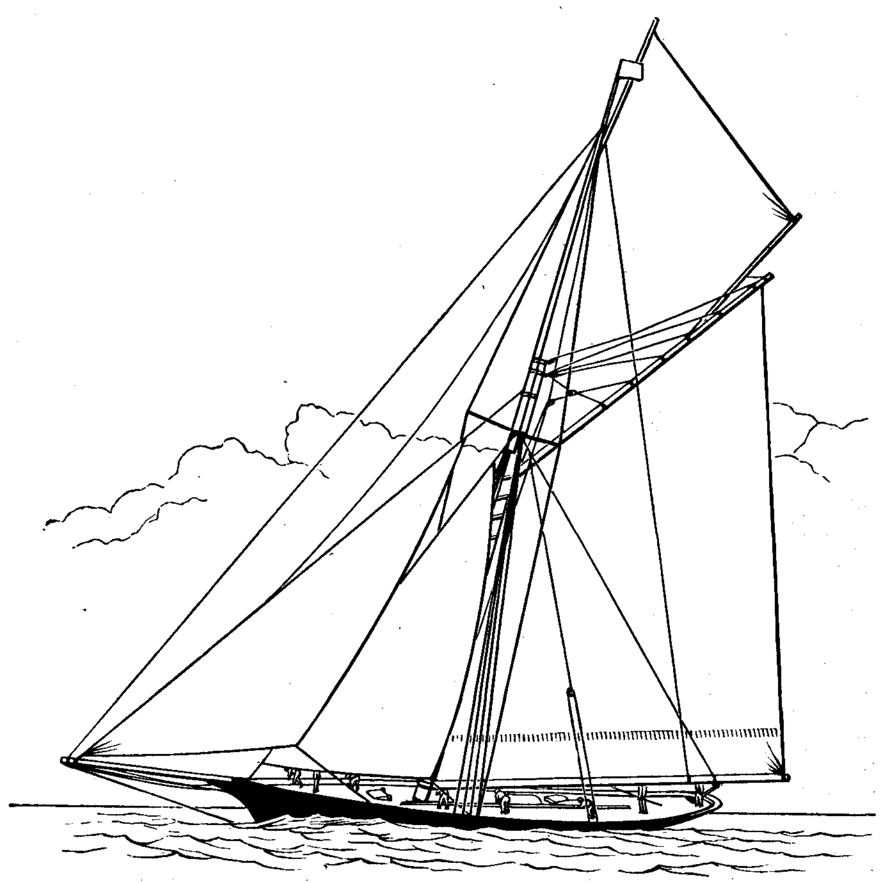
Name.	Start. H. M. S.	Finish. H. M. S.	Elapsed Time. H. M. S.	Corrected Time. H. M. S.
Volunteer	10:40:50¾	4:23:47	5:42:56¼	5:42:56¼
Thistle	10:40:21	4:35:12	5:54:51	5:54:44

The cup therefore remains here, the Volunteer coming in about two miles ahead in the second race.

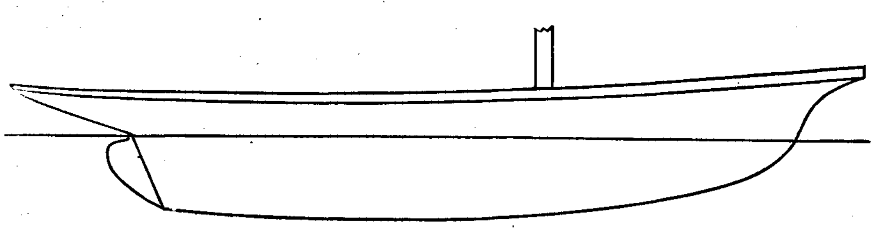
We publish outline views of the two yachts and their sheer plans and midship sections, giving a good idea of their respective features and points of resemblance and difference.



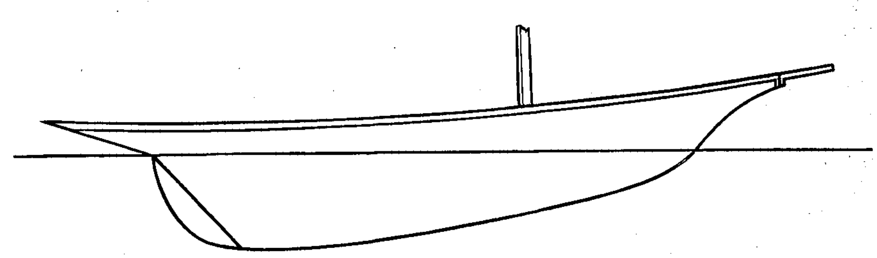
THE VOLUNTEER.



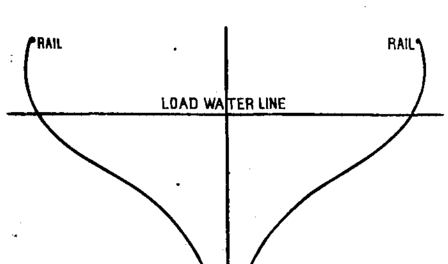
THE THISTLE.



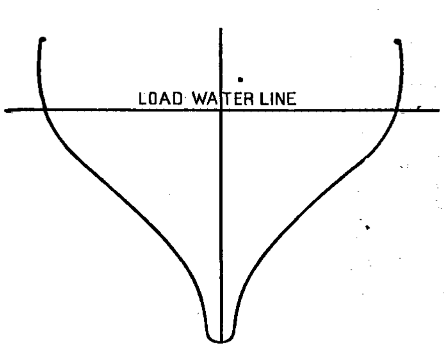
SHEER PLAN OF THE VOLUNTEER.



SHEER PLAN OF THE THISTLE.



MIDSHIP SECTION OF THE VOLUNTEER.



MIDSHIP SECTION OF THE THISTLE.

"The Deadly Toy Pistol."

Dr. John Homans has lately made certain pointed statements concerning the damage done by this infernal contrivance, in the form of a letter to the editor of the Boston *Transcript*. He says he has now two boys under his care whose hands have been injured by the toy pistol, and that four years ago he had five patients whose injuries were due to the same implement, all of whom died of tetanus. He thinks the wound is generally produced by the cartridge exploding in the hand, either by coming back through the breech or in some other way.—*N. Y. Med. Jour.*

VERY elastic caoutchouc tubing gradually loses some of its elasticity. Later, the tubes break on stretching, even if previously laid in warm water, and finally they crack if pressed between the fingers. This change is put down to a very slow formation of sulphuric acid by the action of moist air on the sulphur contained in the caoutchouc. By frequent washing with slightly alkaline water, the action of the acid is prevented. Tubes washed five or six times a year remained perfectly elastic.

A SELF-REGISTERING MEASURE FOR LUMBER.

An improved device for calculating the surface or board measure of lumber of any given length, and registering the several measures taken, is illustrated herewith, and has been patented by Mr. John U. S. Sands, of Meservey, Cerro Gordo County, Iowa. Fig. 1 is a perspective and Fig 2 a sectional plan view, Fig. 3 showing a front elevation with part of the front plate broken away. The front plate of the casing is removable, and has an opening in its middle through which appear the numerals representing the number of feet measured. From the rear of the casing extends a box, which serves as a handle when using the measurer, and in the casing is journaled a shaft carrying a wheel with sharp-pointed teeth which extend through a slot in the bottom of the casing, the teeth being adapted to engage the board to be measured as the casing is moved across the width of the board. On this shaft is also secured, within the box forming the handle, a pinion which meshes into one of a series of different sized gear wheels secured on a shaft journaled in inclined position, these gear wheels meshing into a pinion mounted to slide on and turn a shaft parallel with their outer edges, the pinion being moved forward or backward to engage either of the gear wheels. This pinion is moved sidewise on its shaft by means of a forked arm on a threaded rod in the handle casing, operated by a knob in the outer end, by which also a pointer is moved on the top plate of the handle box to register with numerals indicating the length of the lumber to be measured.

The shaft on which this pinion is moved, to mesh with the larger or smaller gear wheels, carries on its outer end, in the larger casing, a unit disk, with the numerals 0 to 9, and subdivisions of ½, a lug on this disk engaging at each revolution one tooth on the central or tens disk, and a pin or lug on the latter disk engaging at each revolution a tooth in the hundreds disk, which has numerals from 0 to 19. When it is desired to measure the surface of lumber of different widths, but of a certain length, the knob at the outer end of the handle casing is turned till the pointer registers on the top plate with figures indicating the length, the several disks having been set to indicate zero at the opening in the front plate. The measurer is then run across the width of the lumber, so that the teeth of the wheel extending through the slot in the bottom of the casing, by their hold on the wood, turn its shaft and operate the gear wheels, whereby a corresponding motion is communicated to the disks carrying numerals, and the measure is indicated at the opening in front of the casing, each successive measure made revolving the gear wheels and disks proportionately to the width of the lumber which the measure is passed over. The disks are readily turned to the zero point by knobs projecting through the front plate.

Hypnotism.

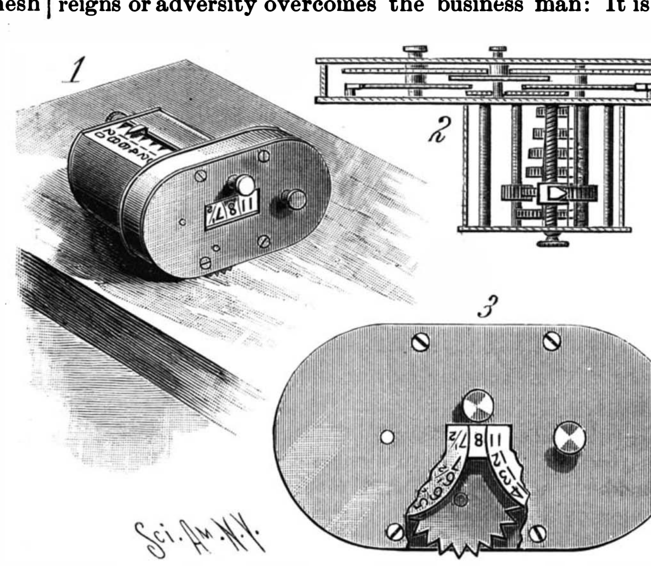
The doings of Professor Charcot's school are certainly curious, but the late communication of M. J. Luys to the *Academie de Medecine*, on the experimental solicitation of emotional phenomena in patients while in the hypnotic state, is so very extraordinary that I cannot pass it by. M. Luys is well known as having studied localization in the brain, and for his works on nervous diseases. He says that his present experiments were undertaken to confirm those made by M. Bureau and M. Bourn, and presented by them to the scientific congress held at Grenoble in 1885. In a few words, the experiments relate to the action of certain substances purely physical in character, and yet having a decided effect on the emotions of these subjects while in the hypnotic state. This seems to vary according to the susceptibility of the person or the different substances employed. They appear to be simply placed in a tube, and this is held against certain parts of the body. Exact details of the mode of operating will be given hereafter, as the Academy has named a commission of five members to examine into the matter and report upon it. The following are some of the statements made by M. Luys:

The physical action of certain substances, such as strychnine, thyme, sparteine, morphine, atropine, and spirits, such as cognac, rum, etc., at a distance is certain. Many different patients were experimented upon, and, as they were entirely ignorant of what sort of substance was being applied to them, there could be no deception on their part. Moreover, nothing is said to the patients, as the substance is silently applied to the part. Instantaneous photographs of the effects produced were taken, copies of which were passed around to show the different emotional phases that the subjects passed through while under the influence of the physical action of the drugs mentioned. It would appear, for instance, that under sparteine the inspiratory muscles go into a convulsion and the whole region of the neck gets hard, while the patient becomes incapable of speaking. Morphine acts differently accordingly as the tube holding it is placed on the right or left side. For instance, placed on the left side of the back part of the neck, it brings about at once an expression of terror, which changes to violent anger if the action is prolonged. If, however, the same tube is placed just back of the right ear, the whole scene changes and the subject passes at once into a languid state and drops into the chair with the soft expression seen on the faces of patients who have taken an internal dose of morphine.

Atropine seems to have an action that causes an extreme state of weakness. The patient remains seated with his face long drawn out and his eyes vague and fixed. If its action is prolonged, the whole body gets stiff and the subject falls into a true opisthotonos. Cognac, rum, and champagne used in the same physical form are said to produce the same stages of intoxication as when taken in the usual way. Drunkenness comes on in eight or ten minutes, passing rapidly from the first slight excitation into complete resolution and inability to stand upright. The dose used in these last cases was 20 grammes [5 drachms] of cognac in the tube, and the process of getting sober again passed through the same phases that are usually observed, and took only the same eight or ten minutes. Some eighty-six substances were experimented with in all.—*Paris Correspondence, N. Y. Med. Jour.*

The Difference Misfortune Makes.

The writer in one of our contemporaries who penned the following has evidently had an experience on the unfortunate side of the subject on which he writes which enables him to picture so well the contrast in the modes of greeting by one's friends when prosperity reigns or adversity overcomes the business man: It is surprising what a wonderful effect the insolvency of a merchant has upon his former creditors! Men who before were only too glad to take him by the arm and laugh and chat with him by the hour now shrug their shoulders and pass him on the street with a frigid "How d' do?" Every trifling item of a bill is hunted up and presented that under other circumstances would not have seen the light of day for months to come. If the bill is paid, well and good; but if the obligation is not immediately canceled, the scowl of the sheriff, perhaps, meets him at the nearest corner. A business man who has never failed can know but little of human nature, for in prosperity he sails along gently, his barque wafted over placid seas by favoring smiles and kind words from everybody. He prides himself on his name and spotless character, and makes it his boast that he has not an enemy in the world; but when adversity and misfortune knock at his door, he is forced to look at the world in a less roseate light. He reads suspicion on every brow, and he hardly knows how to move, or whether to do this thing or the other. He beholds spies about him on every hand, and knows that a multitude of suits and attachments are ready for his back. In order to realize what kind of stuff the world is made of, a man must encounter misfortune, and stop paying his liabilities; and then, if he has real and true friends, they will come promptly forward and prove their devotion. A business failure is a kind of moral sieve, which brings out the wheat and winnows the chaff; and passing through a financial ordeal teaches a man that fair words and affected good will are not the constituent components of a true and reliable friendship.



SANDS' LUMBER MEASURE AND REGISTER.

Florida Oranges.

October brings to bear on the Florida grower a temptation which he has hitherto seldom shown himself able to resist. The orange is his one crop of the year. He has long store bills running up, and interest payments, perhaps, to meet. He allows himself to begin cutting his crop before it is ripe, before it is even colored, sometimes! Generally it will color tolerably well in transit, but if it does not, a judicious heating and sulphuring in the rooms of the commission houses of New York will complete the process.

What is the result? Northern people become prejudiced against Florida oranges. They do not know the circumstances, and indeed a majority of them still believe the old tale that oranges ripen at all times of the year. They find that at least some Florida oranges are sour, whereas the truth is that no orange grown in this State, when allowed to ripen thoroughly on the tree, and not belonging to the sour variety (there are three varieties, the sweet, the sour, and the bitter sweet), can ever properly be termed sour. The fruit growing on the inside of a dense tree, not touched by the sunshine, and therefore of a pale lemon color, or that growing on very rich, rank land, or with strongly nitrogenous manure, is not so sweet as that which receives plenty of sunlight and is of a deep, rich color.

It was stated last year in the newspapers of the State that over 150,000 boxes (bushels) of oranges left Florida before Nov. 1. The first few hundred boxes brought $4 or $5 a box, but the price quickly dropped so low that growers realized very little for their crop, often not enough to pay for the labor and material, to say nothing of the fruit. The remedy for this is cold storage and sales in the spring.

This may pass as an error, perhaps, but to sell frosted oranges is a clear fraud. Freezing may occur on the trees, but it more often happens while the fruit is in transit, at the northern end of the route, for which, of course, the grower is not to blame. It is a long time before a frosted orange gives any indication from its exterior appearance that it has been touched by frost; for two or three months afterward it may easily be sold to the inexperienced without detection. The surest test is that of weight. If it is heavy in the hand, that is proof that it has not been frosted, no matter how dry and hard the skin may feel. To get a ripe Florida orange, never buy one before Christmas, and let it be of a dark reddish yellow, medium sized, round, not longish, and with a skin not too rough. To get a sound one, choose one which weighs heavy in the hand.

There is another fraud which is beginning to be practiced at the North only. This consists in the artificial coloring of them to imitate the bronze or rusty tint peculiar to the oranges of this State. This marking is caused by a minute parasite called the "rust mite," whose stings produce this dark tinge not only on the fruit, but also on the leaves and tender twigs. Some years it is more prevalent than others. This year, for instance, there will be a very large percentage of russets. This tint is a guarantee of quality in three ways: First, it shows that the orange grew in Florida; second, that it grew on the outside of the tree, and therefore received abundant sunlight; third, the numerous punctures of the mites make the rind dry and shrink a little, slightly stunt the growth of the fruit, and so make it sweeter and a longer keeper on account of its hermetical sealing up, as it were. The fraud consists in giving the fruit a light scorching to produce a russet tinge. This shows that this class of oranges, rejected by superficial judges, are gradually gaining in favor in the North.—*Stephen Powers, Country Gentleman.*

The Electro Deposition of Iron.

Prof. W. C. Roberts-Austen, F.R.S., chemist to the mint, has been making some experiments on the electro deposition of iron, a process which in Russia is used on a large scale for printing paper money. According to the *Ironmonger*, the bath used is a solution of ferrous sulphate and magnesium sulphate in equivalent proportion, of specific gravity 1·155. The solution must be so far neutralized by the addition of magnesium carbonate that blue litmus paper scarcely shows any acid reaction. A wrought iron anode, about the same size as the object to receive the deposit, must be employed, and the best interval between the poles is found to be four centimeters. Mr. Roberts-Austen finds that the current best suited for an iron medallion had a strength of only 0·089 ampere. It was provided with two Smee cells, coupled up for intensity. The adherence of the iron to the copper on which it was deposited was reduced by coating the latter with a film of metal; but Mr. Roberts-Austen is trying a thin layer of silver iodide on the copper moulds. The deposited metal is very pure, and its magnetic capacity does not appear to be high. The dies for the Jubilee coins were made by this process of electro deposition. The designs, modeled in plaster, were reproduced in "intaglio" by the electrolytic deposit of copper, and on the copper moulds so prepared iron was deposited. It is of hard and excellent quality, and dies of all sorts for coins have been produced by the reducing machine from such deposits.

AT a recent meeting of the Edinburgh Royal Society, Professor Tait communicated some results on the compressibility of water, of mercury, and of glass. The average compressibility of a 20 per cent aqueous solution of common salt per atmosphere for the first 100 atmospheres is 0·0000316. It diminishes rapidly with the percentage of salt in solution. The compressibility of common lead glass is 0·0000027 at a temperature of 19 degrees C.

Correspondence.

For Star Gazers.

To the Editor of the Scientific American:

Will you please make the following correction in the date of one of the minima of the light of Algol, in the article "For Star Gazers," in your issue of September 24, 1887? Under the heading "Eastern Time," January 20, 5:44 P. M. should read January 20, 6:44 P. M.

ROYAL HILL.

C. O. D. by Mail.

To the Editor of the Scientific American:

The article in your issue of this date, "The Parcel Post," credited to the *American Architect*, and referring to the announcement that the Post Office Department has established a postal parcel service between the United States and Mexico and certain islands in the West Indies, and referring to the superior postal service of Germany in this respect, interested me deeply.

Germany, Austria, France, and Belgium have had for years a system of collecting bills by mail, through the postal authorities. In all these countries, I believe, packages can be sent C. O. D. by mail. This is certainly the case in Austria, for in 1882 I availed myself of it, and found it to work most admirably. A day or two after leaving Vienna I sent an order for some articles of merchandise to that city, to be delivered to me at Innsbruck on my arrival; and on reaching there I found that the postman had previously been there with them, and he being informed of my arrival brought them the next morning; and I paid for the goods, the postage, and the cost of returning the money to the seller. Greatly impressed by the manner in which this service was performed, I wrote a letter to our then Postmaster-General, Howe, advocating it for the United States. He never, so far as I am aware, took any action in the matter. Since then I have repeatedly urged it upon a member of Congress, a very active member of the Post Office Committee. He has been very favorably impressed by it, but has never urged it upon Congress. Of course the express companies would make a very determined fight against any such innovation on one of their privileges; but this is a reform which is bound to come, and when once the people take hold of the idea, the express companies will be powerless to prevent it.

In this connection it is worthy of note that all, or nearly all, of the reforms in our postal service have been borrowed from Europe, and have not originated in the United States, from the postage stamp pretty much all the way down, without a break, to the postal note. But Europe is still in advance of us, and it seems extremely difficult to catch up with it. The C. O. D. postal idea, like so many other good postal reforms already borrowed, is sure to be adopted by us, and the sooner the better. HENRY CAREY BAIRD.

Philadelphia, September 10, 1887.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Southern District of New York.

MCNAB & HARLEM MANUFACTURING COMPANY *vs.* NATHAN MANUFACTURING COMPANY.

Shipman, J.

William Gee's patent, No. 106,150, dated August 9, 1870, for an improved lubricator, declared invalid for lack of patentable invention.

Self-feeding regulated lubricators where the drip of the oil from a reservoir was visible being old and well known, and self-feeding regulated lubricators where the oil flowed from a reservoir into a transparent pipe having been described in an earlier English provisional specification, it required no invention to make a self-feeding regulated lubricator where the oil was delivered in drips from the reservoir into a transparent chamber below the same.

Neither did it require invention to employ a transparent chamber to avoid the effects of wind and dirt upon the old and well-known unprotected drips.

Where an earlier English provisional specification did not precisely anticipate the patent in suit, it may be used to show that no invention was required to make the simple alteration or addition which distinguishes it from the patent in suit.

U. S. Circuit Court.—Eastern District of Pennsylvania.

DOSH *vs.* THE A. J. MEDLAR COMPANY (LIMITED).

Butler, J.

The suit is for infringement of claims 1, 6, and 7 of letters patent No. 90,577, issued May 25, 1869, to Joseph Repetti, for cracker machine; and, also, for infringement of claim 3 of letters patent No. 209,963, issued to Henry Dusch, November 19, 1878, for improvement in soft dough machines.

Held as follows:

Where two old and well-known devices are brought into juxtaposition, and each continues to perform its old function, without any new result issuing from their united action, no patentable combination is produced.

Where a patent is limited by disclaimer to a flat or "tape wire" knife for cutting dough, there is no infringement in the use of a round wire.

Bill dismissed with costs.

U. S. Circuit Court.—Southern District of New York.

RAILWAY REGISTER MANUFACTURING COMPANY *vs.* BROADWAY AND SEVENTH AVENUE RAILROAD COMPANY.

Wheeler, J.

An injunction granted in this cause February 5, 1886, is not violated by the defendant in the use of a device which is a stop on moving the trip hand of a fare register forward beyond zero, but is not capable of being fixed where registration is begun away from the proper place, so as to indicate that fact.

U. S. Circuit Court.—Southern District of New York.

COTTLE *vs.* KREMENTZ *et al.*

Wheeler, J.

This cause rests upon patent for invention No. 202,412, dated April 16, 1878, issued to the orator for an improvement in the construction of collar and sleeve buttons. The specification describes the making of such buttons by striking up the post from the back, forming them in one piece, thickening the post at the base for strength, and soldering the head to the post. There are two claims, one for the improved process of constructing the button and the other for the button, whose tubular post and back are formed in one piece, and having the metal thickened at the base of the post. The defendants' buttons are formed wholly in one piece, but without using the orator's process.

Held as follows:

Letters patent No. 202,412, granted April 16, 1878, to Shubael Cottle, for an improvement in buttons, construed and held valid as to the first claim covering the process, but invalid as to the second claim covering the product.

Buttons similar to those made by the patentee's process were old, and the defendant in manufacturing a like article is not liable for infringement of any patent.

Complaint dismissed with costs.

U. S. Circuit Court.—Southern District of New York.

HOFF *et al. vs.* IRON CLAD MANUFACTURING COMPANY.

Wallace, J.

Letters patent No. 279,871, granted June 19, 1883, to Charles Hoff, for an improvement in coal hods, again considered (see 35 O. G., 1230, for former decision), and in view of English patent to Haseltine, of November 3, 1873, limited.

Under the limited construction the defendant does not infringe.

Bill dismissed, with costs.

U. S. Circuit Court.—Southern District of New York.

COOKE *vs.* GLOBE FILES COMPANY *et al.*

Wheeler, J.

This suit is brought upon patent No. 282,275, dated July 31, 1883, granted to the orator for a letter and invoice file for the reception and classification of papers. The specifications of the patent describe a file having pockets formed of leaves and partitions connected by gussets at the ends, with a piece of tape of linen or other suitable material pasted or otherwise applied to the gussets and connected to the sides of the file by having its ends fastened between the sides and outside covers. The object of the tape is set forth to be to strengthen the tape of the gussets and give stiffness to the parts to which it is attached, and to connect the opposite sides of the file by a stronger and more durable material than the gusseted ends of the pockets are required to be made of.

Held as follows:

Letters patent No. 282,275, granted July 31, 1883, to William A. Cooke, Jr., for an improvement in letter and invoice files, declared void.

The use of a piece of tape, linen, or other suitable material as a re-enforce piece to strengthen the parts of the files in places where they were weak was not the discovery of anything new nor the application of genius to things known, but simply mechanical skill, and does not cover a patentable invention.

Bill dismissed, with costs.

California and Ohio Oil.

The first year in which attention was seriously paid to petroleum in California was 1879, and the following table of the annual production of petroleum in this State since 1879 will illustrate the growing importance of this industry. The figures represent gallons:

1879	568,000
1880	1,763,000
1881	4,194,000
1882	5,403,000
1883	6,000,000
1884	6,000,000
1885	8,760,000
1886	10,950,000

In 1885, California ranked third among the petroleum producing States, and at the present rate of increase she will soon be second only to Pennsylvania. In the oil fields of Southern California much activity prevails. A pipe line from the Sespe wells to the Santa Paula station has just been completed, and another pipe line from the Puente district to Los Angeles is being located by surveyors. A firm of this city is having a steamer built, with a carrying capacity of 3,500 barrels, to ply between Ventura and San Francisco, and a San Diego company is also building a vessel for the same purpose to use between Ventura and San Diego. The Sespe wells, referred to above, appear to be of actual and permanent value. Well No. 1 is good for 600 barrels or more a day, and well No. 2 is flowing 125 barrels a day at a depth of 200 feet.

The Ohio fields, however, are the latest developments, and the entire State has gone crazy over the oil and natural gas boom. They have lately held a week's jubilee in Toledo, and have illuminated the city with natural gas spouts, which can be seen a distance of twenty miles. The natural gas was burning from twenty standpoints, and after the ceremonies were opened by speeches by ex-President Hayes and others, the river was turned into a fountain of fire. This was done by running gas pipes out into the river, and when the gas rises to the surface it is lighted, producing a most beautiful effect.

To give an idea of the gigantic production which so alarmed the editor of the Cincinnati *Commercial*, and caused him to predict a speedy collapse of the earth, we give the following facts, culled from the Toledo *Blade:*

Cygnet is a town of tanks. It is at Cygnet that the Buckeye Pipe Line Company has already built a dozen 35,000 barrel tanks, and will build without delay as many more. A few months ago, where Cygnet now stands the wind whistled through a poor potato patch, and sighed among the trees of the Black Swamp. Now trees, potato patches, large clumps of golden rod, and beautiful bunches of blue asters must all get out of the road of the tank men.

"The greatest gusher in the world," recently mentioned in the *Blade*, was next visited. Wonderful as are the stories told of other wells in other fields, this well certainly stands without an equal in the world.

The well, which is only a short walk from Cygnet, had been flowing at the rate of 250 barrels a day when Mr. Parker said "Shoot it," and Mr. W. J. Morrison, of Findlay, dropped the "go devil."

Never before in the history of the oil fields has such a result been achieved. The oil burst forth in a mighty volume, and it seemed as if the fountains in the center of the earth had been broken up and were being forced up by an unseen and unknown force. Through four lines the oil poured, and the tanks shook and the earth in the vicinity of the well trembled. The thunders from the well can be heard all over Cygnet.

In less than an hour and a half the well flowed 500 barrels into the tanks, and this will give the "oil volcano" a capacity of 8,000 barrels per day. The well is keeping up its reputation for being the greatest gusher in the world, and at the rate it is flowing now all the 35,000 barrel tanks at Cygnet will soon be filled from the "oil volcano."

Wiring a Fractured Knee Cap.

A new method of treating a fracture of the knee cap, "wiring the patella," as it is called, was successfully demonstrated at Bellevue Hospital a day or two ago. The operation, says the *N. Y. Tribune*, was performed by Dr. W. F. Fluhrer, assisted by the house surgeons of the hospital, Drs. M. A. Crockett and W. C. Braisted, and before many prominent members of the profession, some of whom were returning from the Medical Congress on their way to their homes in Kansas City and St. Louis. The liveliest interest centered in Dr. Fluhrer's treatment, not merely on account of his remarkable success in treating fractures of this kind, but as offering an admirable illustration of the careful and complete system of antiseptics used in the hospital. Every possible thing was done toward perfecting the aim and the conditions of the operator. Before the patient was put under ether, Dr. Fluhrer described the case and gave a general outline of his method of treatment, and showed himself ready fully and clearly to answer such questions as any of those present chose to put. The skill with which he manipulated and the ease with which he went about the work elicited the enthusiasm of his fellow surgeons present.

After that portion of the leg to be operated upon was thoroughly lathered and shaved, an incision was made across what is familiarly known as the knee cap. The two sides of the fracture thus revealed were now to be brought together. A sort of crochet needle passed through at carefully sought and directly opposite points on either side was made to carry threads, and these in turn were used to draw through a wire by means of which the two sides of the fracture were pulled closely and firmly together, carefully leaving the tissue outside, which was sewed together in position. Antiseptics were used uninterruptedly during the entire process of the operation. The operation lasted over two hours and a half.

EXPERIMENTS ON THE EFFECTS OF DETONATING GUN COTTON AT THE U. S. TORPEDO STATION, NEWPORT, R. I.

At the 1885 meeting of the American Association for the Advancement of Science and Art, much interest was excited by a paper read by Commander T. F. Jewell, U. S. N., detailing the results obtained at the U. S. torpedo station at Newport, R. I., with cylinders of compressed gun cotton. The reproduction, by the force of the explosion, of characters cut or impressed upon the face of the cylinders was described and specimens were produced. One of the old theories, to the effect that the gases produced in such a detonation preserve for an instant the shape of the original mass of solid material, was rather negatived by the peculiar fact that marks excavated in the cotton were produced, not in relief, but in corresponding depression in the iron. The subject has been further investigated by Prof. C. E. Munroe, chemist in the U. S. naval service. His high authority on the subject of explosives gives peculiar value and interest to his work. At the last meeting of the A. A. A. S., he read a paper on the subject, and exhibited the specimens which we illustrate.

The gun cotton used for the experiments was of the regular service supply. It was compressed into cylinders (Fig. 7) or cubes with truncated corners (Fig. 8). One of the cylinders is also shown in the cut below, where it is designated by A. Their size is two inches high and three and one-half in diameter. The cubes are about the same. Through the center of the blocks of each form a hole is made for the reception of a cap of mercury fulminate.

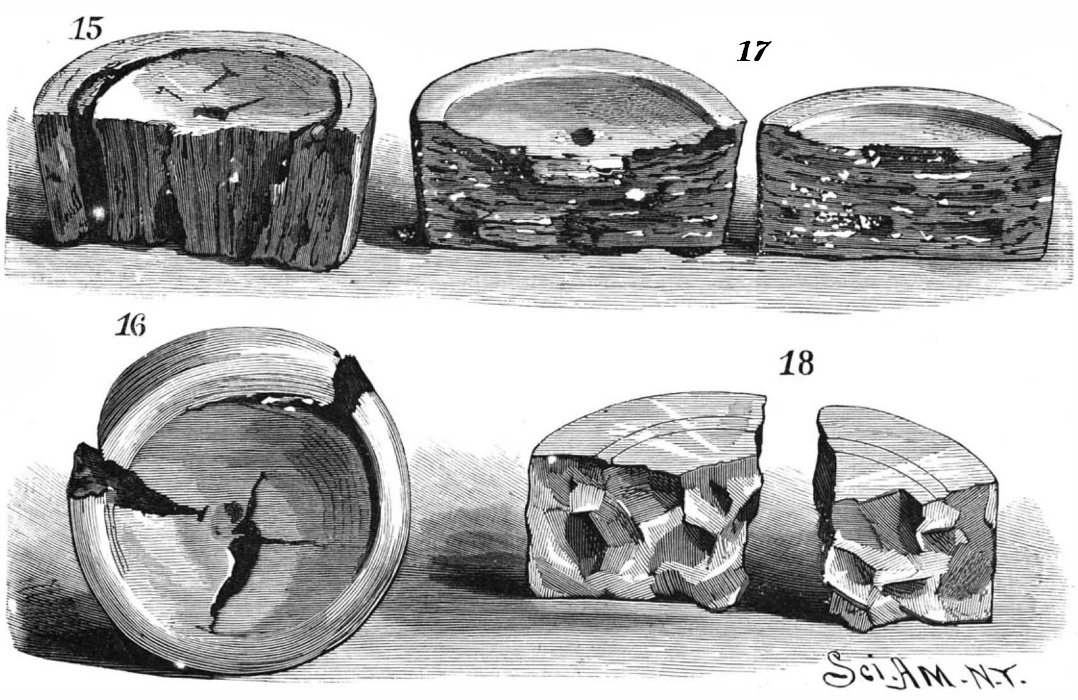
The plates of iron used are about one-half of an inch in thickness and four or five inches square. In conducting the experiments a block of the gun cotton is laid upon one of the plates, resting in its turn upon an iron beam or heavy plate. The detonator is set into the aperture in the center of the block, and a current of electricity from a hand generator is sent through it. This explodes the fulminate, which, in its turn, explodes the cylinder or cube of gun cotton.

The arrangement of the respective parts and the construction of the primer is shown partly in section in Fig. 14. The general arrangement is also shown in perspective in the cut on this page. The fulminate is contained in a copper case. Through its top two wires are introduced, and across the space between their ends a fine platinum wire extends, being secured by soldering. The wire is surrounded by fine gunpowder. Below this is the fulminate. The effect of the electric current is to heat the wire to incandescence. This explodes the gunpowder, which, in its turn, causes the fulminate to explode, and the latter acts upon the gun cotton, effecting its detonation.

The blocks of gun cotton in their manufacture have impressed upon their face the letters U. S. N. and the year of manufacture. These letters are sunk into the face. On placing the cylinder on the iron plate, so as to rest upon this face, and exploding it, a saucer-like depression is produced in the plate. In the center, where the priming aperture of the cylinder was located, an excavation is made where naturally an elevation would be looked for. The letters are reproduced with great exactness, but in the same peculiar way. The sunken letters on the gun cotton appear as sunken characters in the solid iron. In other words, exactly the reverse effect is produced of that which would be anticipated.

This initial experiment was the one first described by Commander Jewell. Starting with this as a basis, quite a series of experiments have been performed.

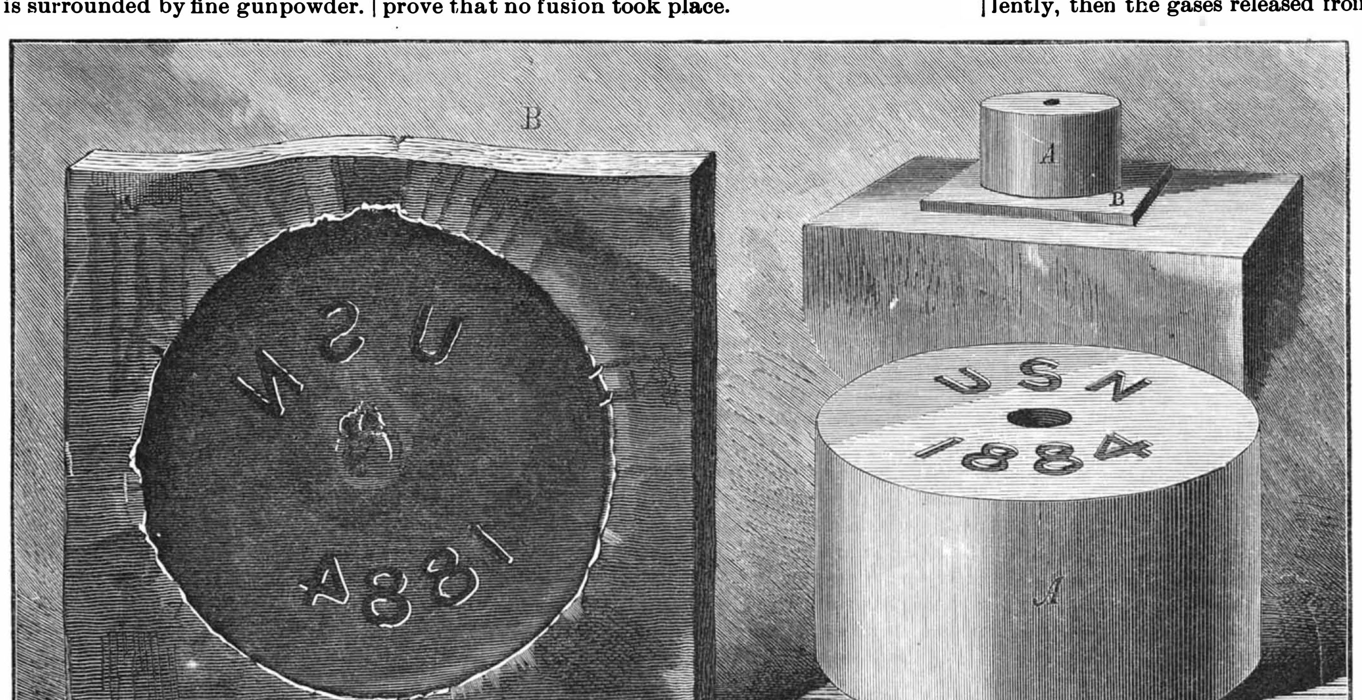
Across the face of a cylinder of gun cotton some grooves were cut by a pen knife. Gun cotton is somewhat fibrous and soft. The grooves, therefore, were not smooth and well defined as if they had been cut in harder material. On exploding the cotton with the face thus prepared in contact with the iron, the grooves are reproduced in *intaglio* with wonderful accuracy.



TESTS OF QUALITY OF IRON AND STEEL.

The little projecting fibers and irregularities are all to be found in the solid iron. Some of the results of this experiment are shown in Figs. 1 and 2. On the same principle, an irregular excavation was made with a gouge in a cylinder, which was exploded upon a plate, with the result shown in Fig. 3.

The next step was to use a plain surfaced cylinder and substitute extraneous markings. This was done by laying a piece of wire gauze over the iron plate. Upon this the cylinder was placed and exploded. The result is shown in Fig. 4. The wire gauze was driven down and so destroyed as regards its structure that it was impossible to say whether it was melted or not. The bright yellow metal, however, was plainly to be seen. Around the edge of the depression radiating marks of the color of brass, and due to fine brass "plating," were formed. The reticulations of the gauze were reproduced with accuracy, the openings forming depressions, while the contour of the interwoven wires remained in relief. In this plate there was no trace or indication of oxidation visible. The brass was all of bright color and of a true brass color. This tended to prove that no fusion took place.



THE INITIAL EXPERIMENT WITH CYLINDER OF GUN COTTON AND PLAIN IRON PLATE.

In Fig. 5 a plate is represented upon which a cylinder was exploded, whose characters were filled with vaseline.

No impression of the letters was produced, the vaseline preventing the action. In some experiments a number of cylinders were piled up on each other. In one instance four were thus arranged and exploded, when a very large and deep depression, corresponding to the central aperture, was produced.

The cylinders of gun cotton were marked differently from the cubes. The latter had letters in relief upon a sunken ground. On exploding one of these, the characters were reproduced in relief upon a sunken ground. The plate is shown in Fig. 6, while directly below it one of the cubes is shown.

The next experiment went to prove that this peculiar effect is only produced by the surface of the gun cotton. Upon a plate of iron some characters were cut. It was laid upon another one with its engraved face downward, and the two were placed upon a bed plate, and a cylinder was exploded upon them. The result was striking only as an illustration of the power of the explosion. The letters were reproduced in relief upon the lower plate. The action was that of a die and blank in a coin press. The two plates are represented in Figs. 9 and 10. One plate was driven down into the other, forming a saucer-like depression and corresponding elevation.

Characters were cut into a plate, and upon the engraved face a cylinder was exploded. Here little effect was produced, except that a secondary impression of one of the letters was discernible. This experiment is about the most unexplainable of all. The plate, after the explosion, is shown in Fig. 11.

It was of interest to determine if a soft body could produce an impression upon iron. Between two plates a couple of green leaves were placed, and gun cotton was detonated upon the pair of plates. Impressions of the leaves were produced, very faint, but exact. One of the plates is shown in Fig. 12. The direct action of gun cotton was next to be determined. Accordingly, a leaf was placed directly under a cylinder of gun cotton, lying between it and a plate of iron. On explosion the leaf was, of course, annihilated, but its impression was left, marked out exactly upon the metal, the ribs and outline all being sharply defined. This plate is represented in Fig. 13.

This interesting series of exhibits illustrates the phenomenon in its various phases very clearly. One of the early attempts at explaining it referred it to the indisposition of air to suddenly change its form when exposed to compression. This explanation was, however, a theory based only upon the first experiment, and fails to account for the action in the case of wire gauze. A more probable one is derived from the projectile force of the gases of explosion. If we assume this kinetic energy to be capable of acting upon the iron so violently, then the gases released from excavations have a longer range of action, and consequently a higher force of impact. Or the force of the gases may be in ratio with the surfaces of emission. In this case an excavation furnishes a larger surface per area of action than does a flat surface. It would seem possible that both of these causes had a part in the reaction.

In Figs. 15, 16, 17, and 18 some interesting experiments are shown illustrating the use of gun cotton as a means of testing the quality of metal. By its use soft iron and steel are distinguished. The steel is broken into angular fragments, as shown in Fig. 18, while iron resists the sudden shock much better, and if it does break, shows a different fracture, one which is far more fibrous. The same test affords a clew to the treatment to which metal has been subjected in the manufacturing process. In Figs. 15 and 16 the section of a bar fractured by it is shown. From the appearance of the metal, it is clear that it was not of even quality. In all probability it was rolled, and the ac-

tion of the rolls did not reach its center. Thus a different quality of metal in the circumference was produced. At any rate, want of homogeneousness is shown, and it is evident that it is not a hammer-forged bar. The appearance of homogeneous iron when fractured is shown in Fig. 17. This purported to be hammer-forged, and from the test there is every reason to believe that it was. Thus a simple and effective method of testing metals is at the service of the mechanical engineer.

GEORGE FREDERIC BARKER.

The proudest boast of an American citizen is that he is a self-made man. To overcome difficulties and acquire a high reputation by persistent effort is indeed well worthy of the highest ambition. Those who have made science a profession have, for the most part, been thoroughly educated and carefully trained in the leading universities and schools of the world. A notable exception is the subject of this sketch, whom we may fairly claim is a self-made scientist.

George Frederic Barker was born in Charlestown, Mass., under the shadow of Bunker Hill, on July 14, 1835. He was the son of a sea captain, who commanded one of the packet ships then sailing between Boston and Liverpool. His early education was received in the public schools of his native town, but in 1849 his parents moved to South Berwick, Me., where he continued his studies in the classical academy of that town, and later at similar institutions in Groton, Mass., and Yarmouth, Me. While a student he showed great fondness for the physical sciences, and even at that time was given charge of the chemical and physical apparatus.

The knowledge thus acquired he applied practically, for he celebrated the Fourth of Julys with fireworks of his own manufacture, and accompanied the performance with electrical displays from Leyden jars, galvanic batteries, and friction machines, which he himself had constructed.

In 1851 his father took him to Europe, and he visited the great world's fair held at the Crystal Palace in London—the first of the international exhibitions, on the juries of which, in later years, he has served.

On his return, the boy, then sixteen years of age, with a fair education, was apprenticed to J. M. Wightman, of Boston, a well known maker of philosophical apparatus. For five years he was employed in this manner, acquiring not only a knowledge of the principles of mechanical construction with the use of tools, but also learning the scientific principles which the apparatus embodied and illustrated.

The system of fire alarm telegraph which William F. Channing and Moses G. Farmer were at that time introducing in Boston attracted his attention, and he formed a warm personal friendship with Mr. Farmer, that has since continued.

His apprenticeship ceased when he became of age, and he determined to supplement his practical knowledge with two years' study. Accordingly, he entered the Yale, now Sheffield, Scientific School, and was graduated in 1858 with the degree of bachelor of philosophy.

His entire university career was limited to a two years' course at Yale, the last half of which was spent as private assistant to Benjamin Silliman, Jr. Compared with those who have supplemented the usual college course with years of study in foreign universities, Professor Barker stands out as a scientist whose early training was practical.

In 1858–59 and in 1860–61, he assisted Professor John Bacon in his lectures on chemistry at the Harvard Medical School, and in 1861 was called to the chair of physical sciences in Wheaton College, Ill.

He was invited, in the autumn of 1862, to fill, temporarily, the professorship of chemistry in the Albany Medical College, where he remained until 1864, having meanwhile pursued a course in medicine, and in 1863 he received the degree of M.D. from that institution.

After delivering his third course of lectures, he was, in 1864, chosen professor of natural sciences in the Western University of Pennsylvania, in Pittsburg, where he remained a year. It was at this institution that the apparatus placed at his disposal for demonstrations proved to be that which he had constructed years before when an apprentice in Boston.

In 1865 the younger Silliman urged his return to New Haven as demonstrator of chemistry in the Yale Medical School. This appointment he accepted, and in 1867 he became the professor of physiological chemistry and toxicology in that department, also having charge of the entire instruction in the academical department of Yale during the absence of Professor Silliman in California, during the college year 1866–67; and he likewise delivered the lectures on chemistry at Williams College in the years 1868 and 1869. In 1873, when the University of Pennsylvania remodeled its scientific department and erected new buildings at West Philadelphia, Professor Barker was invited to fill the chair of physics, an appointment which he accepted and has since filled.

The collection of physical apparatus selected by him, now in the possession of that university, is probably unsurpassed in the United States, and in some branches it is absolutely unique in the world.

Of his original work it is difficult to write, for his career has been so largely a public one that his investigations have either been of a special character, called forth by government or private request.

He was invited by the late Henry Draper to become a member of the expedition which observed the solar eclipse of July 19, 1878, from Rawlings, Wyoming. Professor Barker was specially assigned to the observation of the spectrum of the corona.

For this purpose he used a Merz spectroscope of high dispersion, and during the totality he saw distinctly several of the dark lines characteristic of the spectrum of the sun's disk, thus confirming the observation made by Janssen in 1869. In 1886 the latter again obtained like results, in his observations made at the Caroline Islands.

It was at this time that Mr. Edison, who was one of the party, established the fact of the existence of heat in the solar corona. Indeed, all of the results obtained on the Draper expedition tended to prove that a part of the light of the corona is reflected from the sun.

NATIONAL ACADEMY OF SCIENCES.

During the years since Professor Henry Draper's death, many of his unfinished researches, that were placed by Mrs. Draper in Professor Barker's charge, have been gradually approaching completion, and already some of them have been published.

As an expert in court, Professor Barker has very ably distinguished himself. In the line of chemistry and physics, his reputation is unequaled in the United States, and his great knowledge of these subjects is universally conceded. The power of explaining complicated forms of apparatus in simple language, and of demonstrating to conviction a scientific problem, is the secret of his power.

During his connection with the Yale Medical School, important toxicological cases were submitted to him for examination. Of these the Lydia Sherman case in 1872 is the most celebrated, owing to the interest which it created at the time.

On account of the inefficient testimony offered in the Wharton trial, a doubt had been raised in the public mind as to the possibility of detecting by means of chemical analysis the presence of poison in a dead body.

Mrs. Sherman was accused of having poisoned three husbands and four children within the space of three years, and the bodies of four persons were given to Professor Barker for examination. He established the presence of arsenic in each, and nearly two hundred specimens of this poison in various forms, obtained by him from his analyses, were placed on exhibition in court during the trial.

This overwhelming evidence resulted in a full confession by Mrs. Sherman, thus substantiating the analytical results obtained by Professor Barker, and the confidence of the community was largely restored to a belief in the value of such testimony. The chemical evidence was subsequently inserted as a typical case in the later editions of Wharton and Stillé's "Medical Jurisprudence."

He has also served as expert in many chemical patent cases, of which the phosphate baking powder suit is perhaps the best known, and he was one of the scientific witnesses on behalf of the people in the suit in New York City where the use of the lactometer by the health authorities was opposed.

His attention since his residence in Philadelphia has naturally been more in the direction of physics. With the advent of the electric light, and in its subsequent development, Professor Barker has taken a leading part. His relations with Thomas A. Edison have been exceedingly confidential, and he is the retained adviser on scientific matters to the great inventor.

His intimate knowledge of this subject led to his being requested by the department of justice to act as one of the government experts in the suit against the American Bell Telephone Company. He has appeared in other important telephone suits, and testified in behalf of the American Union Telegraph Company in their suit against the Western Union Telegraph Company on the Page patents.

In 1881 he was appointed one of the U. S. Commissioners to the International Electrical Exhibition, held during that year in Paris, and also was a delegate to the International Congress of Electricians convening at the same time. He was made one of the vice-presidents of the jury of award, and was decorated by the French government with the cross of commander of the Legion of Honor, of which organization he is the ranking officer in the United States.

He was appointed, in 1884, by President Arthur, a member of the United States Electrical Commission, which was formed for the purpose of determining the standard of the electric light.

Among the municipal appointments which Professor Barker has held in Philadelphia, several are noteworthy. These include studies of the local water supply, the quality of illuminating gas, and means for protecting the public buildings from lightning.

As a lecturer, Professor Barker is fluent and forcible, with a perfect command of his subject. For the elucidation of his topic, he finds no experiment too troublesome, and prosaic formulas acquire under his influence new and vivid significance.

During the winter of 1859–60, he gave a series of lectures on scientific subjects in Pittsburg, under the auspices of the Western University of Pennsylvania, and in 1864 he was invited to address the Chemical Society of Union College, on which occasion he spoke on the "Forces of Nature."

In 1871 he delivered a lecture before the American Institute in New York City, on the "Correlation of Vital and Physical Forces," in which he advanced the idea that the word "mind" possessed a certain physiological significance, and could represent the energy phenomena of brain tissue in the same way as mechanical work represents that of muscular tissue. From experiments performed in his own laboratory, he had proved that mental action did not increase the destructive assimilation of brain tissue any more than muscular work increased that of muscular tissue.

His lectures on "Spectrum Analysis" and "Electricity and its Applications" have been given before crowded audiences in the Academies of Music in New York and Philadelphia. In 1876 he was elected to membership in the National Academy of Sciences, and has served on many of its important committees that have furnished reports to the government, notably those "On the Measurement of the Velocity of Light," in 1878; "On the Co-operation with the National Board of Health," in 1879–80; "On the Separation of Methyl from Alcohol," in 1883; and he was chairman of those "On Glucose," in 1883, and "On Opium," in 1886. Professor Barker is also chairman of the standing committee on the Henry Draper medal, which honor was in 1885 conferred on Samuel P. Langley, and in 1887 on Edward C. Pickering.

In 1859 he joined the American Association for the Advancement of Science, and in 1876 presided over the section of chemistry, delivering an address on "The Molecule and the Atom" which is a valuable contribution to theoretical chemistry. At the St. Louis meeting, in 1878, he was elected president of the Association, and after presiding over the Saratoga meeting, delivered his retiring address at Boston, in 1880, on "Some Aspects of the Life Question," a masterly discussion of the oft-repeated, query "What is life?" that attracted very general interest, not only from the scientific world, but also from the cultured public.

Professor Barker is one of the secretaries of the American Philosophical Society, life member of the Chemical Society of Berlin and of the Society of Tele-

graphic Engineers and Electricians in London, and also a member of other scientific bodies, both in the United States and in Europe.

He has published "A Text Book of Elementary Chemistry" (New Haven, 1870), which has passed through eight editions and has been translated into the French and Japanese languages. It has met with great favor, over 10,000 copies were sold within five years of its publication, and it has been adopted officially by many colleges in the United States and also at the University of Tokio, in Japan.

Those who teach science know how hard it is to find a suitable text book on physics, and those who have used his "Chemistry" will be glad to learn that Professor Barker has in preparation a work on physics especially adapted to the wants of teachers.

Japanese Carpentry.

W. K. Burton, in the *Br. Journal of Photography*, gives the following interesting account of how Japanese carpenters work:

The workshop is a room perhaps twenty feet square, the floor all covered with straw mats. We are accommodated with chairs. This is an unexpected and certainly a pleasant advantage. We had looked to sitting on the floor, and accommodating our lower limbs as best we could.

And now to give some idea of the manner of working, if possible. There are four carpenters in the shop. Each squats on the floor with his bench—or what takes the place of the bench—and his smoking gear beside him.

The bench is nothing more than a flat board of hard wood, the dimensions some three or four feet long, about eighteen inches wide, and an inch thick. It lies directly on the straw mats. The smoking gear consists of a stoneware bowl, which is filled with wood ash, in the center of which a few embers of charcoal are kept always alight. The bowl stands in a square box, in one corner of which also stands a short piece of bamboo, into which is knocked the tobacco ash after smoking. The pipe has a wooden stem and a metal mouthpiece and bowl, the latter very diminutive. A pinch of tobacco is put into the bowl, the bowl is thrust among the live embers, a single puff, or at most two, are taken, the ash is knocked out of the pipe into the bamboo pot, and the smoke is over. The tobacco is the very mildest and is cut exceedingly fine. I think no Japanese workman is ever without this smoking gear. In his work he pauses every few minutes, takes his smoke, as I have described, very deliberately, then returns to his occupation. The smoke is by no means unpleasant, but would certainly be too mild to satisfy certain photographers at home that I could mention.

The bench has no arrangement whatever for fixing the work. It is merely the board of wood that I have described, without any addition whatever. That work should be turned out, on such a bench, of a quality to rival all but the finest camera work at home, is a thing I certainly should not have believed unless I had seen it. One thing which enables a Japanese carpenter to get on without any arrangement for fixing his work is that he uses his feet as well as his hands.

It is doubtless mostly due to practice, but also in great measure to the foot gear used by the Japanese, that they can use their toes to grip in a manner which Europeans could not imitate at all. The foot gear consists either of straw sandals or wooden clogs—the latter generally mere thick slabs of hard wood—which are held on the feet each by a thick cord which passes up between the big toe and the one next to it, bifurcates just over the toes, and joins the sandal or clog again at each side of the heel. The foot is thus never cramped or distorted as with us, and the toes can be freely used. A Japanese tailor holds his cloth with his toes, and a carpenter holds and turns about his wood with his feet. I was about to say that he manipulated it, but this, I presume, would not be allowable.

The tools are much more simple than ours. The hammer is merely a cylindrical mass of iron with a transverse round hole through which the handle passes. The saw is merely a strip of steel with serrated edge, and with a "tang" whereby it is fixed into a round handle like a chisel handle, much as we fix a file at home. The work is done by the upward or drawing stroke.

The plane is, in general form, somewhat like ours, but the wooden portion is much thinner—shallower from top to bottom—and the knife is inserted much nearer one end than with us. It is unlike our planes in that there is no second adjustable iron and that there is no wedge for fixing the iron. The iron is just in the form of a chisel, and is held in position by friction against the sides. With the plane, as with the saw, the work is done by pulling or drawing, not by pushing. The knife is fixed near the end, which goes in advance as the plane is drawn along. One would suppose that with such a primitive tool only rough work could be done, but the very reverse is the case. I have seen a Japanese carpenter do what any one who has ever practiced carpentry will know is by no means an easy thing. I have seen him take out of the middle of a board of hard wood a thin, delicate shaving several feet long and the whole width of the plane iron. One reason, perhaps, why such good work is done with the Japanese plane is that unless the edge of the knife is kept in very good condition the tool will not work at all. It is, therefore, kept as sharp as a razor, a deal of time being consumed in the very frequent setting of it.

One result of the simple construction of the Japanese plane is that a carpenter thinks nothing of making a special plane for any piece of moulding or such like work that he may have to do. These are sometimes very minute. I have seen them only about an inch and a half long and three-eighths of an inch wide. It thus comes that much of the work done by us with gauges, chisels, etc., is done by the Japanese with the plane.

None of the other tools that I noticed differed greatly from those used at home, except in being rougher and less finished in appearance.

The work that was being done was merely the exact copying of an English camera and dark slides. At work of this kind the Japanese are very clever, but they appear to have but little capacity for original mechanical contrivance. They, moreover, have very little idea of saving labor by machinery, or of division of labor. The consequences are that, although they turn out work of the kind that I have been describing cheaply—the camera was to cost about one half what it would cost at home—they would turn it out no more cheaply if goods were manufactured on a large scale. If a thousand dark slides were to be made, each one would be made precisely as the first, one workman doing the whole of the work.

It is probably due to this very fact—to the fact that the Japanese use little or no machinery, and that, as a rule, an article is made from beginning to end by one individual—that we owe the indefinable artistic charm which there is in the commonest product of Japanese labor. It is because each article has something of the individuality of the worker in it.

The camera maker thought it his duty to keep us entertained as we watched the progress of the work, and brought up to us, one at a time, what he considered the greatest treasures of his store. He brought first a fine and very large musical box. It was of French make, but set to play Japanese airs—or music rather, for I have failed as yet to find any approach to air or melody in the Japanese singing or playing. He next produced a Hall type writer, afterward various other mechanical toys for our amusement.

The bellows of the camera was being pressed in the selling shop by the simple expedient of piling lithographic stones on the top of it to a height of some four or five feet.

It Pays to Think.

A striking instance of the extent to which labor saving machinery is carried nowadays, says the *Industrial Journal*, is shown in the tin can industry. Everybody knows that tin cans are manufactured by machinery. One of the machines used in the process solders the longitudinal seams of the cans at the rate of fifty a minute, the cans rushing along in a continuous stream. Now, of course, a drop or two of solder is left on the can. The drop on the outside can be easily cleaned away, but it is not so easy to secure the drop left on the inside. It wouldn't do, of course, to retard the speed of the work—better waste the drop, it is only a trifle, anyhow, and to 99 men in 100 it would not seem worth a minute's attention. The hundredth man worked for a firm using one of these machines, and he set about devising an ingenious arrangement for wiping the inside of the can, thereby saving that drop of solder and leaving none to come in contact with the contents of the can. He was encouraged by his employers to patent his invention, did so, and has already received several thousand dollars in royalties for its use. As the machine solders 20,000 cans a day, the solder saved by his invention amounted to $15 a day. It pays to think as you work.

The Sense of Smell in Dogs.

It is, I think, of some interest to supplement the very striking and exact experiments of Mr. Romanes on the scent of dogs by an account of some experiments of a like kind made with a very different kind of dog, viz., a pug bitch. She was taught to hunt for small pieces of dry biscuit in a good sized dining room. The dog was put out of the room and a small piece, not much bigger that a shilling, of dry Osborne biscuit was hidden; and as long as the hiding place was accessible to the dog, she never failed to find it. Sometimes the biscuit would be placed under a heap of a dozen or more newspapers on a dinner wagon, sometimes under a footstool, or soft cushion, or fire shovel, and on two or three occasions in the foot of a boot which had been just taken off, the hiding body being always carefully replaced before the dog was admitted into the room, and without exception the biscuit in a very short time was discovered. It was over and over again proved that the dog did not follow the trail of the person who had hidden the biscuit; often the dog went by a different route, and in some cases one person hid the biscuit and another opened the door.

The experiment which has now special interest is the following one. A small piece of biscuit was placed on the floor under the center of a footstool which was one foot square and six inches high, and standing on feet which raised it one inch from the ground. The dog, from the way in which she would set about moving the stool—not a very easy thing to do, as it stood in an angle of the wall—was evidently certain that the biscuit was beneath, and as scent seemed the only means by which she could have come at this conclusion, I thought to entirely mask this scent and prevent her finding the biscuit by pouring eau de cologne on the stool. I found, however, it had no such effect. The biscuit was as readily and surely found when the eau de cologne was there as when absent. It seems, then, that not only well-worn boots leave behind a recognizable odor, as Mr. Romanes proved, but also that to us at least so odorless a substance as dry plain biscuit emits so much and so characteristic a smell that it immediately spreads, even through considerable obstacles, to a distance of several inches in a few seconds, for in most cases the biscuit was found in thirty to sixty seconds after it had been hidden; thus time was not allowed, one would think, for all the surroundings of the hiding place to become saturated with the scent.—*W. J. Russell, Nature.*

The Government Suit to Annul the Bell Telephone Patent.

For the second time the government has met with a reverse in its suit brought to cancel the Bell telephone patent. The last action was brought in Boston, and was demurred to by the counsel for the telephone company, in great part on the grounds of lack of jurisdiction.

This view the court accepted, sustained the demurrer, and dismissed the bill. The grounds on which the decision was rendered are of much interest as defining the views held by the court of the limitations of its own power in dealing with a regularly issued patent. The argument on the demurrer was given before Judge Colt.

In his opinion, which was handed down Sept. 26, the judge recited the principal allegations, as to want of novelty, fraud, etc., that were brought against the patent by the complainant. He then examined the question of jurisdiction, whether, in the absence of any specific statute, the United States, by direction of the attorney-general, could bring any action in equity to cancel a patent for an invention. This question the court decided negatively, to the effect that the United States had no statutory rights in the matter, as by statute the questions involved in issuing patents were confided to the commissioner of patents. Neither could he find a basis for a general equitable right. Hence the decision was adverse to the complainant. The government, however, propose to appeal the case to the U. S. Supreme Court. In the natural course the case would not be reached for four years. Long before this the decision in the appealed infringement suits will be rendered. So the great government suit now is rather a matter of minor interest.

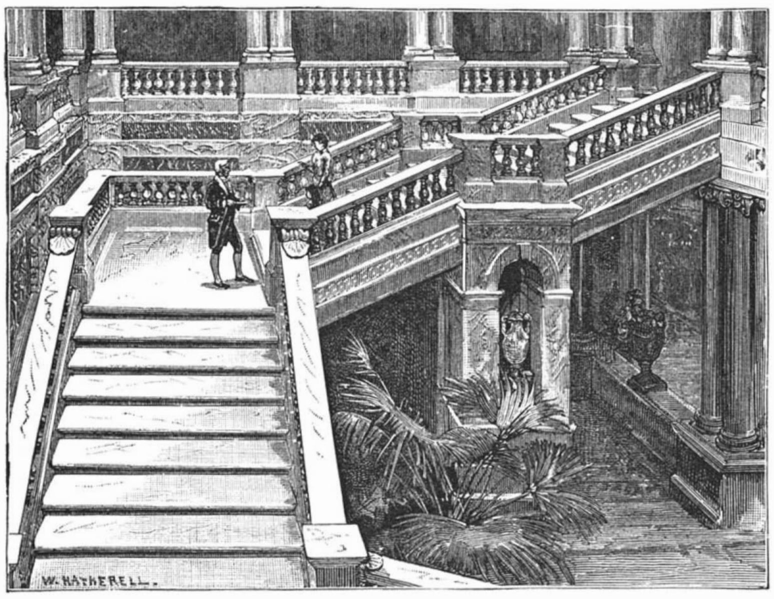
Wheat in America.

Concerning the introduction of wheat into America, reliable information is obtainable. It may be difficult in the present day to realize the fact that wheat was at one time unknown in America; yet prior to the discovery of this continent by Columbus. there was no cereal in America approaching in nature to the wheat plant. It was not until 1530 that wheat found its way into Mexico, and then only by chance. A slave of Cortez found a few grains of wheat in a parcel of rice and showed them to his master, who ordered them to be planted. The result showed that wheat would thrive well on Mexican soil, and to-day one of the finest wheat valleys in the world is near the Mexican capital. From Mexico the cereal found its way to Peru. Marie D'Escobar, wife of Don Diego de Chauves, carried a few grains to Lima, which were planted, the entire product being used for seed for several successive crops. At Quito, Ecuador, a monk of the order of St. Francis, named Fra Jodosi Bixi, introduced a new cereal; and it is said that the jar which contained the seed is still preserved by the monks of Quito. Wheat was introduced into the present limits of the United States contemporaneously with the settlement of the country by the English and other European settlers.—*Milling World.*

BE careful in handling naked lights around bolting chests. Not long ago a correspondent of the *Milling World* entered a mill and found the miller searching for his hair, eyebrows, and beard. He was inspecting a bolting chest, using an unprotected light to illuminate the interior. No sooner was the light thrust into the chest than the miller was startled by a flash and a shock. When he picked himself up, his head was as bald as a celluloid billiard ball and his flowing beard was floating around the mill in gaseous form, sensible only to the nose. Fortunately, the fire did not spread and the accident was not reported.

THE STAIRCASE OF A GREAT HOUSE.

Dorchester House, at Park Lane and Dean Street, London, England, is one of the most remarkable of the many large houses of that great city. It is a modern structure, replacing the old house pulled down in 1839, but the present building possesses the special interest of being the work of a series of artists who each designed his share of the whole. The central feature is a staircase of large dimensions, surrounded on the first floor by a wide corridor communicating with it by arches, the principal rooms being grouped around it on three sides. A visitor, on passing through the entrance hall, enters the lower vestibule, which is part of a wide corridor running transversely across the house, and paved with marbles inlaid in a pattern derived from one of Raphael's cartoons. From this vestibule the staircase is seen between coupled Ionic columns of pink granite, which support the gallery, the view being nearly that represented in our illustration. The marbles lining the walls by the side of the staircase are especially beautiful, being in large panels of a rich dark green, with an inlaid edging of red, the panels being separated from each other by projecting masses of a warm white marble, streaked with dark gray, which form piers carrying the plinths of the coupled columns of the first story. At the top of the stairs is a wide corridor or gallery, the galleries opening on to and surrounding the staircase being characterized by a picturesque grouping of coupled Corinthian columns supporting arches through which views of the different saloons are obtained. The exterior of the building is graceful and refined, though not presenting anything of striking originality.



GRAND STAIRCASE, DORCHESTER HOUSE LONDON.

A NEW ELECTRIC CURRENT METER.*

BY PROFESSOR G. FORBES.

At the present moment the mind of electrical engineers is much directed to the successful means of distributing electricity to a large district from central stations by means of that class of induction apparatus which has received the several names of "secondary generator," "transformer," and "converter." This is the only thoroughly worked out system available to the engineer for an extensive supply of electricity. Currents of an alternating character (*i. e.*, alternately positive and negative in direction, the alternations being at the rate of some hundreds per second of time), and of high tension or pressure, are by this system carried from the engine house, by comparatively thin and cheap wire conductors, to the points of supply. The only difficulty which has been met is in the designing of a suitable meter. There is absolutely no meter available that pretends to be reliable. The very best indicates a totally different result when the same current is passed through it, if the number of alternations of the cur rent (*i. e.*, the speed of the dynamo) be altered. It was to overcome this source of trouble and to remove the last difficulty from an otherwise perfect system of electric distribution that the author undertook the labor of designing and perfecting the meter here described. Some idea of the work expended in bringing it to its present state of perfection will be gained when it is stated that the trial observations during the development of the instrument number nearly 10,000. Seeing that the only electrical actions available were those of chemical action, electro-magnetic action, and heat, that the chemical method is incapable of being used with alternate currents, and that all electro-magnetic meters must vary in their indications with the rapidity of the alternations, the author was led to base his instrument on the heat developed by an electric current. Such an instrument must be equally applicable to continuous currents and to alternate currents, whatever their rate of alternations. Thus a meter is obtained which is practically perfect and more simple in construction than any of those designed for a more limited range of uses.

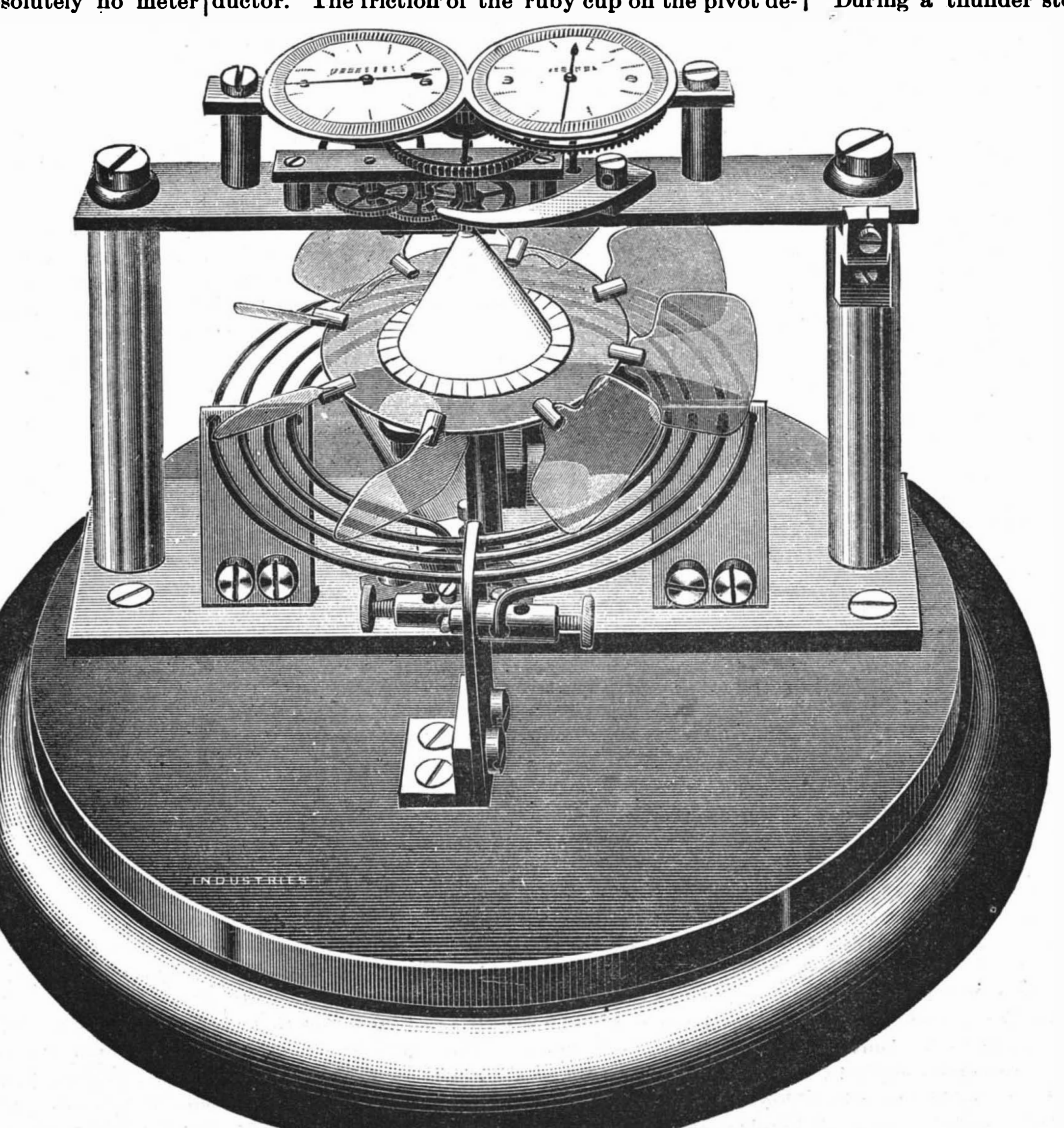
The instrument is extremely simple, both in principle and in construction. It consists essentially of a flat spiral of iron wire with two terminals. Sometimes these two terminals are united to form one, the other being attached to the middle of the wire. Thus the instrument exhibited may be used as an accurate measure for currents from half an ampere or from one ampere upward. Above the conductor a set of vanes is pivoted. This consists of a circular disk of mica with a hole in the center, in which is fixed a pinion with a concentric ruby cup. Round the circumference of the mica disk eight small cylinders of pith are fixed at equal distances, and eight vanes inclined at 45° to the mica disk are attached to the pith cylinders, these vanes being made of the thinnest mica. This set of vanes is supported with the ruby cup resting on a steel point fixed to the base of the instrument. The pinion engages with the first wheel of a train of clockwork actuating the indices, which show upon two dials the number of revolutions made by the vanes. The action of the instrument is very simple. The electric current passing through the iron conductor creates heat, which sets up a convection current in the air, and this causes the vanes to rotate about the vertical axis and drive the clockwork. The number of revolutions indicated on the dials is, through a considerable range of currents, an exact indication of the number of coulombs or ampere hours which have passed through the conductor. The friction of the ruby cup on the pivot determines the smallest current which can be accurately measured, and the friction of the clockwork is imperceptible. The following table shows the performance of one of these vanes. The conductor used had a resistance of 0·1 ohm. The first line shows the rate at which the current was flowing through the conductor. The second line gives the ratio of current to speed of rotation, a ratio which ought to be constant.

Current in amperes	·25	·35	·45	·6	·75	1	2	3	6	12
Ratio of current to speed	76	61·25	50·4	51	50·75	51	51	50·7	51	51·6

When using higher currents, the ratio is equally constant.

Sir William Thomson complimented the author on having practically solved a problem on which he himself had been working for a long time, but not with the same satisfactory results. He was nevertheless extremely pleased at the success achieved by Professor Forbes, because with the invention of a good and reliable meter one of the obstacles to central station lighting had been overcome. The difficulties of making a meter to correctly record alternating currents were very great, one of them being due to the action of the current upon itself. Even in continuous current instruments a slight variation in the strength of the current will sometimes cause an error due to self-induction. Thus, in one of his current balances, the slight variations in the speed of the engines introduced an element of error. Professor Forbes had, however, succeeded in devising a type of instrument in which the self-induction can be made as small as desired, and thus a degree of accuracy to within two or three per cent might be obtained, which is quite sufficient for practical purposes.

After several questions from other speakers, Professor Forbes replied that he found absolutely no difference in the working of the meter, whether it was traversed by an alternating or a continuous current. In fact, an alternating current seemed to introduce less apparent resistance than a misdirected current rapidly made and broken. The size of the glass cover he found to be of importance, the larger cover allowing the mill wheel to start with a smaller initial current. An instrument intended for a maximum supply of twenty lamps would start with half the current strength required for one lamp, and would register correctly from one lamp to twenty. The wheel work does not introduce any appreciable friction.



PROFESSOR FORBES' ELECTRIC METER.

* Read before the British Association, September, 1887. From *Industries*.

Water Works Struck by Lightning.

During a thunder storm on August 24, the water tower of the water works at Mount Vernon, N. Y., was struck by lightning and damaged, a hole being made in the side which allowed a considerable quantity of water to escape with great force. The supply was checked until the necessary repairs can be made.—*Sanitary Engineer.*

[At the time of the above alleged stroke, we sent an assistant to examine the structure, thinking it rather strange that so excellent a conductor as an iron tower, about 100 ft. high, well connected electrically with the earth, should be damaged by lightning. As a result of our inquiry, we learned that about three hours after the thunder storm above mentioned a small leak was discovered in the side of the tower about 65 ft. from the ground. The leak consisted of an empty rivet hole, through which the water was spurting. Our conclusion was the hole had been filled by a defective rivet, the inner head of which having fallen off, the water pressure then pushed out the bolt. There were no visible signs of any lightning stroke.—EDS. S. A.]

THE easiest way to make holes through an oyster or clam shell is to drill the holes with a hard, sharp steel drill, the same as used for drilling iron. Use the drill dry.

Building Sites and Choosing Houses.

A writer in a recent number of *Chambers's Journal* makes the following good suggestions to persons about to build or purchase a house. In selecting a house, or a site for a new one, remember that where the sun will shine on the house for some hours a day, one element of good is secured, especially if the sunshine enters at the windows of the living rooms or rooms most used during the daytime. After the aspect has been found to be suitable, and that a plentiful supply of sun and air is insured, attention should be given to the general position and construction of the house. If the ground is at all porous, a layer of concrete not less than six inches thick, and composed of cement or lime and broken bricks or gravel, should be spread over the whole of the ground covered by the building. This will prevent the passage of ground air up through the floors. Air will travel through the ground for some distance, and, as it invariably becomes contaminated by taking up carbonic acid gas in its passage, is not suitable for inhaling. The house acts as a sucker on the ground; and if, unfortunately, the site is one on "made" ground—that is, composed of all the refuse of a town—the ground air becomes the medium of disease. No houses should be built without a well-ventilated air space between the earth and the ground floor, especially if the layer of concrete on the surface be omitted. The walls should be built of good hard-burnt bricks or non-porous stone set in lime or cement mortar. Common underburnt bricks or porous stones hold moisture, which evaporates with a rise in the temperature, and so chills the air in the house. If the bricks or stones of the walls are suspected of holding moisture, the whole of the external surfaces should be covered with cement, or tiled or slated above. The foundations of the walls should rest on thick beds of concrete bedded in the earth; and to prevent the ground damp rising up the walls, a damp-proof course of slates in cement or a bed of asphalt should be laid in the full thickness or width of the wall just above the ground line. Dryness in this climate is so essential to health that any building which in its floors, walls, or roof sins by admitting moisture should be rejected as a place of residence by those who value their health. In tropical climates buildings are constructed to keep out the heat; but here, we build to retain the heat and keep out the cold.

The Gas Hammer.

Mr. Dugald Clerk recently read a paper before the British Association on "The Tangye Gas Hammer." This hammer is the invention of Mr. James Robson, and was exhibited at the Inventions Exhibition in 1885. Since then it has been continually in action at Cornwall Works, Birmingham. It has been much simplified and improved in its details, and is as reliable and controllable as any steam hammer. It resembles a steam hammer in design, and contains a piston, a piston rod connecting with the top containing the hammer, and an anvil block. The cylinder, however, is longer, and a space is left above the hammer piston to contain the necessary charge of gas and air. A second piston is arranged to fill and discharge the explosion space. The impulse for the blow is given to the hammer piston by the explosion above it, and the return of the hammer to its highest position is effected by means of a voluted spring. When out of action, therefore, the hammer always remains up. The charging piston is actuated by a hand lever, and is an easy fit in the cylinder. When the hand lever is moved in one direction, the charging piston moves downward toward the hammer piston, and the products of a previous explosion pass through automatic lift valves in it to the upper side. On the return movement the charging piston rises, and the automatic valves, closing, cause the spent gases to be discharged at a port in the top of the cylinder, while a fresh charge of gas and air is drawn in between the pistons. At the upper extremity of the stroke the charging piston covers the exhaust port, and then an igniting valve opens to effect the explosion. The hammer descends, strikes its blow, and when the hand lever is moved to transfer the exhaust gases again, the spring returns to its upper position. This is the complete cycle of action. The hand lever actuating the second or charging piston is arranged to move precisely like the hand lever commonly used in steam hammers for controlling the slide valve. The similar movement produces precisely similar results, and the effort required is no greater. The blows can easily be given at the rate of 120 per minute. To reduce the force of the blow, the hand or foot is moved through a smaller range and a smaller volume of explosive mixture drawn in, and therefore a more feeble explosion obtained. For very light blows a relief valve is opened to discharge a portion of the pressure. The energy of the blow may be determined in two ways—first by taking an indicator diagram, and second by measuring the velocity acquired by the hammer before it strikes the forging. Diagrams so taken proved the maximum pressure to be 56 lb. per square inch above the atmosphere, and an average of 22·5 lb. during the whole downward movement of the hammer piston. As the cylinder is seven inches in diameter and the fall of the hammer 6 inches, this amounts to 433 foot pounds, which, after adding on the energy due to the fall of the hammer and deducting that due to the resistance of the springs, becomes 406 foot pounds, or 3·62 cwt. falling through 1 foot. This is the case when the hammer cylinder is cold. When hot, the average driving pressure falls to 20 lb. per square inch, and the blow to 3·19 cwt., falling through a foot, or 358 foot pounds. The gas used is 1 cubic foot for 94 of the latter blows. Birmingham gas, with which these experiments were made, costs 2s. 6d. per 1,000 cubic feet, or 33 cubic feet for 1d., and $33 \times 94 = 3{,}102$ blows are thus obtained at the cost of 1d. This is an exceedingly economical and satisfactory result. The paper concluded with a statement of the several purposes to which this hammer can with advantage be applied.

A Woman Gardener.

Madame De Rostaing, at Seillans, in the Department of Var, France, has a flower farm of about 23 acres, located on the southern slope of the Maritime foothills, about 2,000 feet above the level of the Mediterranean and perhaps 20 miles from the coast, so writes United States Consul Mason, at Marseilles. The calcareous soil was naturally thin and poor, and the olive trees, which had occupied the ground for a century or more prior to 1881, yielded but scanty and unsatisfactory returns. The slope of the surface was so steep that the waters of a spring which flows from the rocks above the track could be but imperfectly utilized for irrigation, and the land was regarded as practically worthless. In 1881 the proprietress caused the olive trees to be removed and the land prepared for flower culture. First, the ground was dug up to a depth of 4 feet, the larger stones were removed and built into sustaining walls for the terraces, into which the surface was divided and leveled. Along the upper margin of each terrace a shallow ditch was cut, connected with transverse channels, which supply the spring water for irrigation.

The abruptness of the slope will be indicated by the fact that on the tract of 18 acres the terrace walls required to produce a series of level or gently sloping surfaces are 2,166 yards in length. Thus terraced, the tract yielded 17½ acres of prepared ground for planting. In the autumn of 1881, 45,000 tufts of violet and 140,000 roots of the white jasmine were planted. The following spring the remainder of the ground was planted with roses, pelargoniums, tuberoses, and jonquils, and a laboratory erected for the manufacture of perfumes. The position proved to have been well chosen, the plants grew vigorously and strong, and in 1885, the fourth year after planting, the flower farm at Seillans, which had previously yielded a rental of $115 a year, produced, according to the statement of the proprietress, perfumes valued at $43,150, giving a net profit of $5,750. The difficult nature of the ground had made its preparation unusually laborious and expensive, but in the foregoing balance sheet for 1885 interest on the entire investment is included in the expense account, so that the profits as stated purport to be clear and legitimate.

Modern Guns.

General S. V. Benet, Chief of Ordnance, U.S.A., was lately interviewed by the New York *Herald*, and is quoted as saying:

"We have now twenty-five of the new steel guns ready, and twenty-five more will be ready in a few months. That will be sufficient to arm all our light batteries with breech-loading guns. The steel for these guns was supplied by the Midvale Foundry, of Philadelphia.

"All modern steel guns are of one of two systems—either the Krupp bolt system or the 'interrupted screw' used in the French service. Our guns are of the latter system, which seems to offer the greatest advantages. Like all good modern inventions, it is an American one. So, for that matter, is the Krupp, or, rather, what gave Krupp's invention the practical value. The great trouble with the Krupp gun was the escape of gas at the breech. This was overcome by the aid of the 'Bradwell plate,' the invention of Colonel Bradwell, an American, who sold Krupp the invention. It consists of a thin steel plate, with elastic edges, that fits into the breech, and the pressure of the gas wedges it tightly against the sides and prevents the escape of gas.

"Our new field guns weigh 800 pounds, and drive a shot of about twelve pounds in weight by means of 3¼ pounds of powder. The caliber of these guns is 3·2 inches. In old days a pound of powder was considered sufficient for a twelve pounder, but these new guns carry two and a half miles. At least we think they will, for they have not yet been thoroughly tested in this respect.

"The carriages for these guns are not yet ready. They will be of steel, and will be, when finished, the handsomest gun carriages in existence. Our great object was to combine lightness and solidity.

"The largest guns now in existence are the four great 125 ton guns Krupp made for the Italian government. They are intended for coast defense, and are now, I believe, at Spezia. When Krupp tested these guns before the Italian board of officers he fired one of them eighty times himself.

"Whitworth was for a long time supposed to make the best steel. His process is to condense the steel by subjecting it to a tremendous pressure while in a semifluid state. A Whitworth tube will under this pressure be shortened about one-eighth of its original length. Other manufacturers obtain this result in a minor degree by hammering. Armstrong at first made his guns of hammered iron, so far as the tubes were concerned, with steel hooping, but now his guns are entirely of steel, as the others. We have not a single breech-loading gun on our coast.

"The American infantry soldier fires 800 rounds a year—about ten times as many as the soldier of any other nation uses in the same time. This amount of practice makes them the best marksmen in the world. We have an army of marksmen.

"The board of officers before whom the new inventions in magazine guns were tested selected three for experiments to be made by troops in the field. These were the Lee, the Chaffee-Reese, and the Hotchkiss. The army report was unfavorable to them all, the verdict being that the present Springfield rifle was the best rifle for the frontier.

"But could troops armed with the Springfield hold their own with troops armed with a magazine gun?

"No; for in every battle a time must come when the soldier shall be able to discharge his piece five or six times in a few seconds. Every magazine must be detachable. With the Lee this was the case. With the others it was not. It must be detachable, because until at close quarters the firing will be more effective with a rifle loaded in the ordinary way without the incumbrance of a magazine.

"A new problem with the present system of rapid firing is how to get ammunition to a skirmish line. There is danger in the present system of ammunition boxes, containing 1,000 rounds and tightly nailed up. The soldier, having difficulty in opening it, not infrequently dashes the box against a tree to break it open. We have invented a box that overcomes this difficulty. It is watertight, opens readily, and is perfectly safe to handle."

Dangers of Electric Light Wires.

At Lincoln, Neb., on September 21, a workingman named Smith was horribly mutilated in a remarkable manner. On O Street, at the corner of Ninth, hanging from a telegraph pole and lying along the ground for a distance was a broken telephone wire, which had in some manner become crossed, or in connection with one of the electric light wires. As Smith was passing along the street he saw the wire burning, and, attracted by the strange appearance, and not realizing what it was, evidently took hold of it to ascertain what it meant. The shock he received was terrific, and his shrieks brought hundreds to the street. He could not loosen his hold on the wire, and it burned his hands to the bone. In his writhings and contortions the charged wire came in contact with his head, burning out one of his eyes and laying the side of his face open. Wherever it struck his body it cut like a knife. A bystander, realizing the peril of the man, ran to him, grabbing him to pull him from the wire, but by the shock he received when he came in contact with the body of the man he was knocked ten feet into the street and utterly prostrated, so that it was feared he was also killed. By this time the electricity had either burned the man Smith loose from the wire or he had succeeded in his struggles in breaking away. He was picked up and carried into an adjoining restaurant and a half dozen physicians summoned. The man presented a horrible appearance, and despite the physicians' efforts to put him under the influence of morphine he shrieked and writhed in the agony he suffered until taken to the hospital. The doctors express the opinion that he may survive his injuries, although it appears impossible.—*Kansas City Journal.*

Quartered Lumber.

A few years ago there was little if any lumber sawed quartered, or with the grain. Now not only oak but many other woods are being sawed more and more in that manner. Any consumer of lumber will tell you that it is far the better way to manufacture. We now have oak, poplar, gum, and sycamore in large quantities thus sawed. It costs more to saw quartered stock than plain, but it is much more valuable. The waste is considerable. Take a 24 inch 12 foot log, clear and straight, and 75 per cent of it will make good quartered firsts and seconds if properly managed. Probably no wood except oak has so grown in popularity as quartered poplar. It is used plump inch, six inch, and up wide, and immense quantities are now used by piano manufacturers. There is a scarcity of it, and any one who finds plain poplar dull and hard to sell should quarter-saw his stock. The *Northwestern Lumberman* says it is worth from $3 to $5 a thousand more.

ENGINEERING INVENTIONS.

An electric attachment for locomotives has been patented by Mr. Norman F. Chase, of Montrose, N. Y. The invention covers a novel combination and arrangement of parts whereby a person at the side of a track or at a station may cause certain devices upon the locomotives to be operated for signaling the engineer, and so that danger signals, etc., may be effective.

A railway rail bracket has been patented by Messrs. John Waterman and Nelson A. Gray, of Villisca, Iowa. It is formed with a head having bolt holes near its opposite ends and having the shank united at one end with the head centrally between the ends of the latter, and with a longitudinal rib, being intended especially for use in connection with guard rails.

A boiler has been patented by Mr. James A. Cauldwell, of Owego, N. Y. It is a sectional boiler formed of a series of hollow rings resting one upon another with their apertures in alignment, the space within the rings forming the fire and combustion chamber, the bolts by which the several sections are held together being so formed and placed that the sections and the bolts will expand about equally.

A railroad tie has been patented by Mr. Charles W. Yost, of Middletown, Pa. It consists of a bed plate having at each end an upturned tongue and slots, in combination with chain plates with a slot, a tongue, and pendent locking tongues, with device for locking the chains to the bed plate, so that the rails cannot spread and the chains give strength to the tie and relieve the bed plate of direct wear of the rails.

AGRICULTURAL INVENTIONS.

A seeder and cultivator has been patented by Mr. James Montgomery, of Munster, Ill. It is adapted more particularly for dropping seed grain between rows of corn stalks left standing after harvesting the corn crop and immediately harrowing in the dropped seed by cultivator plows to assure proper growth of the grain.

A harrow attachment has been patented by Mr. Calvin Kessler, of Pendleton, Oregon. The harrow is made with U-shaped perforated bars adapted to be raised and lowered upon the tooth bars, by means of which the teeth can be cleaned without stopping, or by lowering the bars so that the teeth will not project, they are made to serve as runners to permit the harrow to be readily transported from place to place.

MISCELLANEOUS INVENTIONS.

A biographical photograph card has been patented by Mr. George W. Fountain, of Cameron, Mo. Combined with a photograph card having a recess and a slot or opening is a blank having ears and a finger tab, whereby a short biographical record may be preserved in conection with a photograph.

A device for adjusting clothes lines has been patented by Mr. August W. R. Liebau, of New York City. It is a novel device by which the length of traveling clothes lines is adjusted, whereby they may easily be stretched or eased, and securely held in such adjustment, with provision also for carrying a large surplus line.

A cotton-seed press has been patented by Mr. William C. McBride, of Brooklyn, N. Y. Two hydraulic presses are located one above another, with a fixed plunger between them, the lower press raising a truck with perforated pipes leading into apertures, and there are various other novel details of construction and arrangement of parts.

A slope grader and ditching machine has been patented by Mr. John C. Sage, of Gainesville, Ga. Combined with a truck are outer and inner rollers, adjustable shovels, and other novel features of an improved ditching machine, the invention being an improvement on a former patented invention of the same inventor.

A windmill has been patented by Mr. Hiram Watkins, of Pueblo, Col. Combined with a vertical main shaft is a horizontal drum wind wheel having pivoted blades, which may be adjusted by an attendant at the base of the tower, there being a vertically reciprocating cross head on the shaft connected with and operating a gear wheel, with other novel features.

A reciprocating printing machine has been patented by Mr. Thomas H. Cole, of East Albany, N. Y. It has a revolving bed adapted to serve as an inking pad upon one face and platen upon the other face, the type carrier being operated up and down by a crank and pitman, and motion being communicated to the bed therefrom.

A book holder and cover has been patented by Messrs. Frank X. Cline and Alexander Cornstadt, of Portland, Oregon. It is a device which may be used for filing pamphlets, letters, and bills, and also as a cover or case for protecting books, or a number of books or pamphlets, and for carrying them from place to place.

A boot jack has been patented by Mr. James H. Kennedy, of Eola, La. It has a V-shaped notch for receiving the heel of the boot, and a loop formed of a metallic rod passing around the front of the boot jack and clamped to its sides, grooved edges of the boot jack forming guides for the looped rod, which engages the front part of the boot.

Improvements in accordions form the subject of two patents issued to Mr. John F. Stratton, of Brooklyn, N. Y. The inventions cover various novel details, including an extra set of keys, key valves, reeds and reed valves, added to the regular set of melody keys, and tuned to permit the player to perform, in connection with the regular set, all the notes in the scale, the same note to be sounded both by pushing and drawing the bellows, whereby the performer can execute in the melody all the notes and chords in the scale with a corresponding harmonious bass in the accompaniment.

NEW BOOKS AND PUBLICATIONS.

FOOD ADULTERATION AND ITS DETECTION. By Jesse P. Battershall, Ph.D., F.C.S., Chemist United States Laboratory. New York: E. & F. N. Spon. 1887. Pp. 328.

This work, on account of the competence of its author and of the elegant style of its production, is to be welcomed as a valuable addition to the chemical literature of this country. Dr. Battershall, for many years chemist in charge of the United States Laboratory in the appraiser's department of the Custom House, has had many very difficult problems in proximate analysis presented to him for solution. In these years many food products and similar substances have been examined by him to ascertain their purity and nature. In the work before us this experience is applied to one of the most difficult subjects of analytical work, the detection and determination of impurities and adulterations in food. The range of the work is extensive. The general headings into which the subject is divided are too numerous to give here in full. Tea, coffee, and other bases for beverages and beverages themselves are treated of at length with their adulterations. Milk and its products, flour, bakers' chemicals, sugar, pickles, olive oil, spices, and miscellaneous products, are included. The book closes with two chapters of peculiar value. One gives the bibliography of the subject, a laborious compilation of periodicals, official reports, and books on food adulteration. The last chapter is devoted to legislation. It gives the various United States laws and statutes of individual States on the subject of adulteration. The book is beautifully illustrated with colored plates illustrative of tea leaves and the spurious leaves mixed with them, and with a number of photomicrographic plates of butter and milk slides. Too much credit cannot be given to author, publisher, and engraver for the conscientious way in which they have all done their work. Although largely devoted to American practice, the book will undoubtedly have a good circulation abroad, and we hope it is the precursor of many future editions.

Special.

MIGHT AS WELL DIE ON THAT AS ANYTHING ELSE.

When one has suffered on, month after month, consulted all the best "Medicine Men" within reach, tried all the remedies suggested by sympathizing friends, still suffers on, becoming weaker and more wretched, it is little wonder that such an one becomes despondent and cries out, "I might as well die on one thing as well as another, and, therefore, will try anything, even the Compound Oxygen."

Mr. Alonzo Clark, chief salesman in the large business house of Davis, Collamore & Co., of New York, was so greatly reduced by long continued lung trouble, proceeding from malaria, that the doctors gave him up. They said, "If you have any business affairs to arrange, you had better arrange them soon, for you cannot live long." He had all the symptoms of advanced consumption. By this time he thought the doctors had done all they could do for him, which they verily had, at the rate of ten dollars a visit. Somebody dropped a hint in his ear about Compound Oxygen, and he thought he might as well die on that as anything else. But on taking it for a little while, he found he was not going to die. To make a long story short, Mr. Clark is again at his post in the store on Broadway, and attending to business with his old-time regularity. He is, as might be expected from his experience, a very firm believer in Compound Oxygen.

This Compound Oxygen has a history embodied in a very interesting two hundred page treatise, which is sent by mail on application to Drs. Starkey & Palen, 1529 Arch Street, Philadelphia, Pa.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

"So full, in fact, is the treatment of nearly every subject discussed, that, as the book now is, it is the most complete American treatise on civil engineering which has yet appeared. The amount of labor which must have been bestowed upon it is almost appalling. The tables are more complete than in any other book that we know of, and the author, in the preface, says that 'most of them have been entirely recalculated expressly for this book.' Altogether the book is the most complete of its kind that has yet been published either in this country or in Europe. It is very fully illustrated, not with copies of superannuated cuts which have done service in old works, or are advertisements for manufacturers, but with engravings all new and purchased expressly for this work."

We quote as above from a review by the *Railroad Gazette* of one of the earlier editions of Trautwine's "Civil Engineer's Pocket Book." Reviewing the 9th edition, or twenty-second thousand, the first of the "new editions" (1885), the same journal said:

. . . "The additions and substitutions are so numerous and so well chosen that there is hardly an important topic of the volume which has not been affected by them and improved."

Still further improvements appeared in the edition of 1886, and in those of the present year.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) G. H. asks (1) if hydrogen gas is better than coal and water gas for balloons. A. Hydrogen gas is far superior in lifting power to coal gas, and still more to water gas. It leaks out from a balloon, however, much faster than either. 2. What is the cheapest way to manufacture it, and how to obtain it pure? A. The general way of making it is to dissolve zinc or iron scraps in sulphuric acid and collect the gas evolved. It may also be made by passing steam over red hot iron turnings contained in a tube. 3. How much in weight will a cubic foot of hydrogen gas lift? A. 1,000 cubic feet of hydrogen will lift about 44 pounds.

(2) J. W. K. writes: I have an electro-magnet that will attract a weight of two pounds suspended at a distance of ⅛ inch from the poles of magnet. Now, what I would like to know is, what the loss would be in attractive power if the poles of the magnet and armature were nickel plated? A. The loss would be very slight.

TO INVENTORS.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 20, 1887,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Accordion, J. F. Stratton.... 370,217, 370,218
Adjustable table, S. Zenger.... 370,227
Aluminum, extracting, O. M. Thowless.... 370,220
Ambulance, H. H. Judson.... 370,063
Animal trap, H. G. Stone.... 370,101
Axle box, car, J. R. Baker.... 370,084
Axle box, H. Rogers.... 370,088
Axle skein, H. W. Nott.... 370,080
Baling press, A. Wickey.... 370,170
Baling presses, bale weighing attachment for, A. Wickey.... 370,171
Banjo, W. R. Wood.... 370,172
Bath tub, W. D. Stewart.... 370,098
Battery. See Secondary battery.
Bed lounge, A. Stark.... 370,095
Bed, sofa, S. Karpen *et al*.... 370,065
Beds, crib attachment for, W. C. Walter.... 370,112
Bell collar, J. J. Marshburn.... 370,271
Bell cord coupling, E. Brombacher.... 370,289
Bell, door, C. L. Livingston.... 370,269
Belt, driving, F. B. Brock.... 370,237, 370,238
Belt shifter, G. W. Miller.... 370,153
Bin. See Flour bin.
Binnacle, ship's, F. W. Cross.... 370,248
Boiler, J. A. Cauldwell.... 370,241
Boiler cleaner, D. N. Baxter.... 370,306
Boiler cleaner, F. W. Hornish.... 370,060
Book holder and cover, Cline & Cornstadt.... 370,244
Boot, fabric, M. V. Beiger.... 370,307
Boot jack, J. H. Kennedy.... 370,197
Boots or shoes, shank burnisher for, J. J. Fitzgibbon.... 370,053
Bottle jacket, H. Lightwardt, Jr.... 370,268
Bottle stepper, M. S. Cahill.... 370,045
Bottle stopper, H. C. Walter.... 370,291
Box. See Axle box. Fare box. Fire alarm box.
Box for samples, etc., O. Hoffstadt.... 370,059
Brace. See Shoulder brace.

Bracket. See Railway rail bracket.
Brake. See Car brake.
Brake shoe, G. M. Sargent 370,090
Brick machine, D. Woodbury 370,173
Burner. See Gas burner. Hydrocarbon burner.
Bustle, H. O. Canfield 370,181
Bustle, T. P. Taylor 370,103
Cab, hansom, J. C. Robinson 370,352
Calcining apparatus, A. Droit 370,326
Calculator for grain, etc., A. Seargeant, Jr 370,284
Calculator, time, W. Wood 370,364
Camera tripod, W. H. Carpenter 370,240
Can protector, milk, J. H. Irwin 370,144
Cans and bottles, device for handling, D. D. Brown 370,179
Car brake, J. Hahn 370,190
Car brake, F. Tentschert 370,104
Car coupling, B. M. Bennett 370,115
Car coupling, H. R. Hunt 370,062
Car coupling, I. Kling 370,348
Car coupling, E. D. Shobe 370,092
Car couplings, pin support and link adjuster for, A. B. Ewing 370,184
Car heater, M. B. Derrick 370,049
Car heater, A. Putnam, Jr 370,085
Car, sand, W. H. Barrows 370,232
Carburetor, J. Leede 370,149
Carpet stretching machine, L. Hinkle 370,257
Carving fork, F. W. Brittin 370,236
Cash indicator and register, J. J. Webster 370,363
Caster, furniture, W. Livingstone 370,270
Chair. See Folding chair. Hammock chair. Operating chair.
Chenille, machine for making, F. Landenberger .. 370,148
Chuck, lathe, J. T. Paget 370,083
Cigar bundling machine, J. M. Fry 370,252
Clamp. See Rubber dam clamp. Suspender loop clamp.
Clasp. See Pocket book clasp.
Cleaner. See Boiler cleaner.
Clock for timing watches, striking, J. F. Beyerle .. 370,038
Clock striking mechanism, J. L. Sullivan 370,219
Clothes line, H. E. Percival 370,348
Clothes lines, device for adjusting, A. W. Liebau. 370,199
Clutch for power presses, F. M. Leavitt 370,198
Clutch, friction, J. L. Bogert 370,118
Clutch, friction, G. L. Hopping 370,332
Coat adjuster, D. H. Purves 370,209
Cock grinding machine, R. A. Regester 370,160
Coffin, T. H. Mooney 370,276
Coffin fastening device, W. Hamilton 370,331
Comb. See Curry comb.
Combination lock, J. W. Hard 370,254
Combination wrench, H. W. De Courtenay 370,048
Cotton press, U. T. Stewart 370,288
Coupling. See Bell cord coupling. Car coupling. Felly coupling. Thill coupling.
Cuff holder, C. G. Bloomer 370,089
Curry comb, C. B. Crosby 370,047
Curtain pole, O. A. Strobel 370,289
Damper and blower for open grates, A. Orelup 370,279
Damper regulator, F. Leclere 370,267
Disinfectant, C. H. Moore 370,277
Door attachment, W. W. Allen 370,300
Door hanger, G. M. Waldorf 370,109
Doors, combined glass holder and number plate for, W. H. Taylor 370,166
Doors, weather guard for, P. P. Negroponte 370,207
Drill. See Expansion drill.
Eaves trough hanger, C. Lumm 370,073
Electric lights, manufacture of filaments for incandescing, T. A. Edison 370,124
Electric meter, T. A. Edison 370,123
Electrical transmission of power, T. A. Edison, 370,125 to 370,131
Embroidered fabric, E. Cornely 370,246
Engine. See Gas engine. Gas motor engine. Rotary steam engine.
Expansion drill, M. T. Chapman 370,046
Fabric. See Embroidered fabric. Textile fabric.
Fabric turfing implement, J. Borton 370,309
Fare box and change maker, combined, J. L. Kail. 370,261
Felly coupling, J. F. McConnell 370,076
Fence, J. A. Hay 370,256
Fence, J. S. Orr 370,157
Fence, T. D. Wilson 370,299
Fibrous plants, apparatus for disintegrating, B. F. Sparr 370,286
File or clamp, paper, M. F. Berry 370,116
Filter for cisterns, F. M. Rankin 370,281
Fire alarm box, B. S. Flanders 370,328
Firearm and air gun, combined, J. G. Folsom 370,329
Firearm, magazine, P. A. Altmaier 370,032
Fire escape, R. Sutherland 370,102
Flour bin and sifter, combined, F. Sieb 370,093
Flower, artificial, A. Heck 370,140
Folding chair, C. H. Lambkin 370,265
Forceps, G. W. Melotte 370,204
Fork. See Carving fork.
Fuel, feed regulator for liquid, J. F. Irons 370,336
Fumigator, G. S. Boin 370,233
Furnace and burner for burning hydrocarbon oil, W. Field 370,251
Furniture, school, J. C. Camburn 370,314
Game apparatus, M. T. Wheeler 370,224
Game apparatus, parlor, J. P. Lundeen 370,074
Gas burner, C. B. Todd 370,107
Gas engine, J. Charter 370,242
Gas engine, F. W. Crossley 370,322
Gas motor engine, Holt & Crossley 370,258
Gas producer, W. L. McNair 370,273
Gas tanks, blow pipe connection for, J. R. Knapp. 370,067
Gas, treating natural, T. G. Springer 370,358
Glass and other plates, joining bar for uniting, M. Macleod 370,075
Glass, apparatus for rolling, Brogan & Malloch 370,177
Glass beveling machine, T. F. Gilroy 370,187
Glass cover for pictures, etc., J. A. Egginton 370,133
Glass, manufacturing checkered, Brogan & Malloch 370,176
Glass to produce designs thereon, apparatus for rolling, Brogan & Malloch 370,178
Gold and silver, refining, Johnson & Ryan 370,338
Governor, steam engine, E. J. Armstrong 370,308
Grader and ditching machine, slope, J. C. Sage 370,069
Grain binder, Baker & Pridmore 370,304
Grain binders, clearer for, Whiteley & Bayley 370,297
Grinding mill, N. P. Bowsher 370,310
Gun sight, B. Long 370,344
Guns, automatic sight for turret, Noble & Murray 370,156
Hair pin, M. J. Steffens 370,096
Halter, W. G. Scaeefer 370,163
Halter, rope, Lynch & Petty 370,346
Hame, B. W. Jones 370,196
Hame and collar fastener, H. L. Quigley 370,086
Hammer, power, W. R. Jenkins, Jr 370,260
Hammock chair, V. P. Travers 370,222
Handle. See Shovel handle.
Hanger. See Door hanger. Eaves trough hanger.
Harrow, Bell & Ritty 370,037
Harrow, M. C. Moore 370,154
Harrow attachment, C. Kessler 370,264
Harrow or cultivator, L. F. Hartman 370,138
Harvester, W. F. Olin 370,082
Harvester and binder, combined, D. Strunk 370,360
Harvester, grain, Whiteley & Bayley 370,298
Hatchway for elevators, automatic, A. J. Blaikie. 370,308
Hay rake, horse, W. W. Kelchner et al 370,263
Hay tedder, R. G. Utter 370,169
Heater. See Car heater.
Hip roll or angle bead, metallic, J. S. Thorn 370,167
Hitching post, A. A. Parker 370,158
Hoisting and conveying machine, A. E. Brown, 370,311, 370,312
Hoisting apparatus, J. Monighan 370,078
Holder. See Book holder. Cuff holder. Photographic web holder. Pillow sham holder. Spinning ring holder. Ticket holder.
Hood, boa, and collar, combined, M. Bermond 370,174
Hook. See Lifting and pulling hook. Snap hook.
Horseshoe, soft ground, L. Brigham 370,040
Hub, vehicle, B. Schad 370,285
Hydrocarbon burner, J. F. Irons 370,337
Hydrocarbon burner, J. Marion 370,151
Index, C. S. Perley 370,280
Indicator. See Cash indicator.
Infusions, apparatus for making, J. Hobbs 370,141
Ironing machine, A. T. Hagen 370,187
Jack. See Boot jack. Lifting jack.
Lamp, carbureting, A. Kitson 370,340, 370,341
Lantern, A. Loeffelholz 370,201
Lap ring, T. N. Pulliam 370,084
Latch and lock combined, W. D. Doremus 370,325
Leather or other material, mechanism for uniting scraps of, F. Knox 370,068
Ledger, petit, H. A. Pershing 370,349
Level, spirit, P. L. Fox 370,054
Leveling instrument, T. C. Thomas 370,106
Lifting and pulling hook, A. A. Porter 370,350
Lifting jack, E. B. Griffin 370,253
Lock. See Combination lock. Permutation lock.
Lock, W. D. Doremus 370,183
Locomotives, electric attachment for, N. F. Chase 370,243
Loop closing machine, E. L. Howe 370,143
Malt germinating apparatus, P. Weinig 370,296
Mantel and fireplace lining, combined, W. W. Neuer 370,155
Mattress for water beds, H. H. Judson 370,064
Measure and register, lumber, J. U. S. Sands 370,212
Measuring machine, cloth, E. M. Bliss 370,175
Medicine, cough remedy, C. Haycock 370,191
Metal cutting shears, E. H. Watrous 370,295
Metals, electric welding and tempering, E. E. Ries 370,282
Metals from their ores, separating, D. W. Birmingham 370,366
Meter. See Electric meter.
Milk and separating cream, device for cooling, N. Moes 370,205
Mill. See Grinding mill. Roller mill.
Mixing machine, R. M. Hunter 370,335
Moulder's pot, R. A. Regester 370,159
Mowers, grass receptacle for lawn, W. R. Twiggs. 370,361
Music leaf turner, H. W. Stone, Jr 370,165
Nails, machine for making cut, L. Goddu 370,135
Nut blanks, die for shaping, M. Kennedy 370,066
Oar blade, G. W. Lingle 370,070
Operating chair, T. A. Long 370,071
Ore concentrator, J. A. Jones 370,145
Paper bag machine, C. B. Stilwell 370,099
Paper cutting machine, E. J. Sterling 370,287
Patternmaker's tram, W. S. Burroughs 370,313
Peanut stripper, C. W. Nicholson 370,278
Pen, fountain, A. J. Kletzker 370,342
Pencil sharpener, B. S. Cohen 370,182
Pencil sharpener, slate, I. P. Maxwell 370,272
Perforating machine, E. B. Stimpson, Jr 370,100
Permutation lock, M. L. Harris 370,056
Photograph card, biographical, G. W. Fountain 370,186
Photographic paper, apparatus for coating, G. Eastman 370,050
Photographic paper, coating, Walker & Eastman, 370,110, 370,111
Photographic web holder, I. H. Stoddard 370,216
Piling, sheet, J. A. Wakefield 370,108
Pillow sham holder, S. F. Marchant 370,202
Pin. See Hair pin.
Pipe. See Smoking pipe.
Pipes, safety attachment for steam or other, W. T. Johnston 370,339
Planter, P. W. A. Becker 370,036
Plastering machine, brick, R. E. Hunn 370,061
Plow, D. Lewis 370,069
Plug for nail or other holes, wood, Little & Stoddard 370,200
Pneumatic dispatch, sending device for, Bryson, Jr., & Mudge 370,044
Pocketbook clasp, R. R. Debacher 370,122
Post. See Hitching post.
Pot. See Moulder's pot.
Powders, apparatus for dividing medicinal or other, I. Robbins 370,351
Power. See Water power.
Preserver, fruit, A. E. Barber 370,085
Preserving meats, etc., vessel for, P. E. Establie .. 370,250
Press. See Baling press. Cotton press. Seed press.
Presses, curb for, F. W. Cross 370,247
Pressure regulators, diaphragm for fluid, T. McSweeney 370,152
Printing machine, reciprocating, T. H. Cole 370,245
Printing presses, feed governor for, J. L. Cox 370,321
Protector. See Can protector.
Pulley, expansion, B. J. Riley 370,087
Pump, centrifugal, J. G. Bruggeman 370,042
Railway, H. L. Stillman 370,164
Railway cross tie, D. C. Heller 370,192
Railway crossings, automatic gate for, W. H. Bishop 370,117
Railway frog, A. H. Ege 370,051
Railway gates and signals, mechanism for operating, J. Hahn 370,188
Railway rail bracket, Waterman & Gray 370,292
Railway switch, J. Hahn 370,189
Railway switch, W. C. Meeker 370,274
Railway tie, R. C. Luckens 370,072
Railway tie, C. W. Yost 370,226
Railways, underground conduit for electric and other, E. E. Ries 370,283
Rake. See Hay rake.
Ranges, cooking attachment for, W. P. Abendroth 370,228
Rattan working machine, E. L. & J. G. Rungert 370,355
Regulator. See Damper regulator.
Rein attachment, check, E. T. Covell 370,320
Ring. See Lap ring.
Roller mill, J. Stevens 370,097
Roof, E. Horbaczewski 370,259
Roofing plate or shingle, metallic, Cortright & Darlington 370,317
Rotary steam engine, E. E. Thomas 370,105
Rubber dam clamp, H. H. Johnson 370,194
Ruling machine, I. M. Brown 370,041
Saddle, riding, Laughlin & Thomas 370,266
Saddle, riding, P. J. Pefley 370,208
Saddle tree, harness, E. T. Covell 370,318
Saddle trees, seat for harness, E. T. Covell 370,319
Sash balance, C. H. Ames 370,302
Sash balance, F. R. Hunt 370,334
Sash fastener, W. R. Abrams 370,229
Sash fastener, J. Brady 370,235
Sawmill carriages, steam feed mechanism for, W. E. Hill 370,058
Saw swaging machine, B. H. Miller 370,367
Scales, automatic grain, S. Case 370,316
Scraper or leveler, earth, C. J. Minard 370,077
Scraper, road, Moulton & Booth 370,347
Screen. See Winnower screen.
Screwdriver, D. R. Hart 370,255
Screw threads, die for rolling, C. D. Rogers 370,354
Screws, machine for making wood, C. D. Rogers .. 370,353
Seat. See Stool seat.
Secondary battery, O. C. Flick 370,134
Seed press, cotton, W. C. McBride 370,203
Seeder and cultivator, J. Montgomery 370,206
Seeder, broadcast, T. A. Churchill 370,120
Seeding machine, Alston, Jr., & Basket 370,301
Semaphore, A. A. Strom 370,359
Sewage, apparatus for burning, M. Vincent 370,223
Sewing machine, A. M. Whipple 370,114
Sewing machine, A. F. Wileman 370,225
Shafting, detachable collar for, B. Truxal 370,168
Shears. See Metal cutting shears.
Shoes, device for cutting buttons from, L. C. Tappey, Jr 370,290
Shoulder brace, C. J. Haley 370,055
Shovel handle, metallic, J. O. Mantor 370,150
Sifter, coal and ash, D. L. Falardeau 370,185
Signal and pyrotechnic electric light, A. C. Ferguson 370,052
Skimming device for milk cans, A. E. Mendenhall 370,275
Skirt lining, J. Reinhardt 370,161
Skiving machine, W. S. Fitzgerald 370,327
Slag trough or spout, J. F. Keiper 370,262
Smoking pipe, A. L. Johnston 370,195
Snap hook, G. A. Huff 370,333
Snow, apparatus for loading, J. P. Luyster 370,345
Snow sweeper, W. H. Barrows 370,231
Soap making apparatus, W. A. Grant 370,330
Sole fastening wire, L. Goddu 370,136
Spinning machine, G. W. Cumnock 370,324
Spinning ring holder, J. Booth 370,234
Spool, Cumnock & Skillings 370,121
Square, framing, G. A. Staples 370,215
Stamp, hand, E. Reynolds 370,211
Stand. See Umbrella stand.
Stone cutting machine, D. Brereton 370,119
Stool seat, H. Ocorr 370,081
Stopper. See Bottle stopper.
Store service apparatus, J. F. Camp 370,180
Stove, combined laundry and cook, J. T. Dugdale. 370,249
Stoves, ash chute for, H. W. Holcomb 370,142
Stoves, grate for heating, Walker & Wilbur 370,362
Sugar in boxes, machine for packing cube, Hersey & Winton 370,057
Supporter. See Wall supporter.
Suspender loop clamp, G. F. Atwood 370,033
Switch. See Railway switch.
Table. See Adjustable table.
Telegraph, printing, R. J. Sheehy 370,357
Telegraphy, T. A. Edison 370,132
Telephone system, F. C. Watkins 370,293
Telephones, adjustable support and automatic switch for, S. P. Jermain 370,193
Telephones, auditory transmitter for, M. H. Allison 370,230
Textile fabric, B. Scarles 370,091
Thill coupling, J. B. Rathbun 370,210
Thill coupling, J. T. Sollenberger 370,094
Ticket holder, E. F. Smith 370,214
Tie. See Railway cross tie. Railway tie.
Tobacco evaporating and heating apparatus, R. J. Young 370,365
Toy, L. Schuetz 370,356
Toy, mechanical, C. M. Bartholomew 370,305
Track bolting machine, Kimball & Appleton 370,147
Trap. See Animal trap.
Tree. See Saddle tree.
Trough. See Slag trough.
Tub. See Bath tub.
Umbrella stand, H. Westphal 370,113
Valve, steam, E. R. Bryant 370,043
Vise equalizer, E. D. Sloan 370,213
Wall supporter, J. H. Carroll 370,315
Warping or reeling machine, V. & J. Royle, Jr 370,162
Washing machine, M. Nations 370,079
Watch, A. Junghans 370,146
Water power, Culver & Crow 370,323
Windmill, H. Watkins 370,294
Winnower screen, C. Hayward 370,139
Wire rope, R. A. Tilghman 370,221
Wrench. See Combination wrench.

DESIGNS.

Carpet, N. Komori ..... 17,730 to 17,733
Glass, sheet, A. L. Rowe ..... 17,734 to 17,737
Hood, L. M. Frank 17,728
Pianos, ornamental panel for, J. Hardman 17,729
Type, W. F. Capitain 17.727

TRADE MARKS.

Boilers for heating purposes, steam, W. B. Dunning 14,769
Boots and shoes, lasts for, J. McComber 14,774
Butter, Fox River Butter Company 14,771
Draughtsmen's and engineers' supplies, E. G. Soltmann 14,775
Extracts and perfumery and toilet soaps, fine, Eastman & Bro 14,770
Mineral spring water and medicinal preparations containing said water, Massasoit Spring Water Co 14,773
Plows and plow points, Gowanda Agricultural Works Co 14,772

A Printed copy of the specifications and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 361 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated, the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

SOME OF THE CONDITIONS AFFECTING the Distribution of Micro-organisms in the Atmosphere.—A lecture by Percy F. Frankland, Ph.D. Pasteur's experiments. Tyndall's experiments. Miquel and Freudenreich's experiments. Solid cultivating media. Hesse's method. Micro-organisms at different altitudes. Micro-organisms in sea-air and in the air of buildings. Late improvements in apparatus and methods. With one figure. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 604. Price 10 cents. To be had at this office and from all newsdealers.

FIFTY YEARS' PROGRESS IN TELEGRAPHY.—By W. H. Preece, F.R.S. An interesting historical paper. Improvements in apparatus. Telephones, Pneumatic telegraphs, Cables, Railway telegraphs. Capital invested in telegraphs. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 607. Price 10 cents. To be had at this office, and from all newsdealers.

THE GREAT TOWER AT PARIS.—Description, by Mr. Eiffel, of the mode of construction of the foundations of the great 984 foot tower. With two illustrations showing sections of the caissons. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 607. Price 10 cents. To be had at this office and from all newsdealers.

ANTOINE LAURENT LAVOISIER.—Sketch of the life of this eminent French chemist; with a translation of a hitherto unpublished letter from him to Black, the great English investigator. With a portrait. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 603. Price 10 cents. To be had at this office and from all newsdealers.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

COMPLETE LISTS
—OF—
MANUFACTURERS

Of ANY ARTICLE or in ANY TRADE furnished at reasonable rates by the

Armstrong & Knauer Pub. Co., Ltd.,
822 & 824 Broadway, New York,

Publishers of "THE MANUFACTURERS OF THE UNITED STATES," for 1887, arranged by ARTICLES and TRADES. Giving the Manufacturers of over 20,000 Articles and 89 Separate Trades.

PRICE $15.00.

(This book will be found invaluable to all Patentees.)

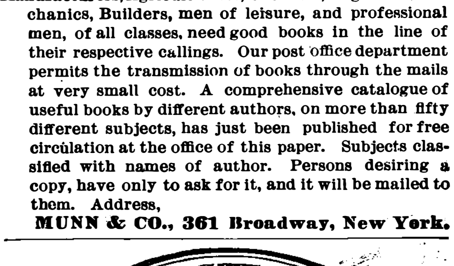
Patent Key Fastener

Impossible to turn or remove the key from the outside. The only SURE way of preventing lock picking. Send for descriptive circular. Price 25c. complete. Agents wanted everywhere. Send for terms. Sample for 25c. postal note.
LINCOLN, HOLLAND & CO., Sole Manufacturers, No. 8 WASHINGTON SQUARE, Worcester, Mass.

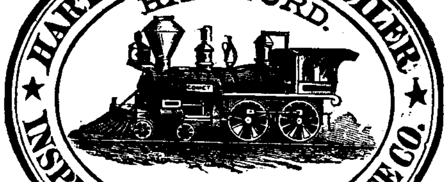
THE COPYING PAD.—HOW TO MAKE and how to use; with an engraving. Practical directions how to prepare the gelatine pad, and also the aniline ink by which the copies are made; how to apply the written letter to the pad; how to take off copies of the letter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 438. Price 10 cents. For sale at this office and by all newsdealers in all parts of the country.

USEFUL BOOKS.

Manufacturers, Agriculturists, Chemists, Engineers, Mechanics, Builders, men of leisure, and professional men, of all classes, need good books in the line of their respective callings. Our post office department permits the transmission of books through the mails at very small cost. A comprehensive catalogue of useful books by different authors, on more than fifty different subjects, has just been published for free circulation at the office of this paper. Subjects classified with names of author. Persons desiring a copy, have only to ask for it, and it will be mailed to them. Address,
MUNN & CO., 361 Broadway, New York.



$10.00 to $50.00 per night. A light and profitable business. **Magic Lanterns and Views** of popular subjects. Catalogues on application. Part 1 Optical, 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc. **L. MANASSE, 88 Madison Street, Chicago, Ill.**



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

Mention this paper.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *forty-one years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.
BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

UNEQUALED For House, Barn, and all out-buildings. Anybody can put it on.
PRICE LOW.
Write for Sample and Book.
143 Duane St., New York City.

"How to save re-shingling, stop leaks effectually and cheaply in roofs of all kinds, or lay **new roofs.**"
Particulars **free** if you mention this paper.

INDIANA PAINT & ROOFING CO.——INDIANAPOLIS, IND.——INDIANA PAINT & ROOFING CO.

FOR SHEDS OR OUTBUILDINGS we are now manufacturing a most excellent roof for
$2.00 PER 100 SQUARE FEET,
Including nails, caps, and paint for entire roof. We also have first quality sheathing for lining inside.
$1.50 PER ROLL OF 300 SQ. FT.
Keeps building cooler in Summer, warmer in Winter.
TRY IT!

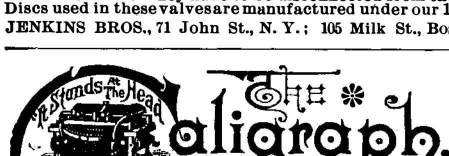
JENKINS BROS. VALVES.

THE ENDORSEMENT OF FIRST-CLASS ENGINEERS AND MECHANICS THROUGHOUT THE COUNTRY has fully demonstrated these valves to possess the following advantages over all other valves now in use:

1. A perfectly tight valve under any and *all pressures of steam, oils, or gases.*
2. Sand or grit of any kind will not injure the seat.
3. You do not have to take them off to repair them.
4. They can be repaired by any mechanic in a few minutes.
5. The elasticity of the Disc allows it to adapt itself to an imperfect surface.

In Valves having ground or metal seats, should sand or grit get upon the seat, it is impossible to make them tight, except by regrinding, which is expensive if done by hand, and if done by machine soon wears out the valve, and in most cases they have to be disconnected from the pipes, often costing more than a new valve. The Jenkins Discs used in these valves are manufactured under our 1880 patent, and will *stand any pressure of steam, oils, or acids.*

JENKINS BROS., 71 John St., N. Y.; 105 Milk St., Boston; 13 So. Fourth St., Phila.; 54 Dearborn St., Chicago.



Address: The American Writing Machine Co., Hartford, Conn.; New York Office, 237 Broadway.

DO NOT BUY a Drill Chuck until you have seen the "*Hartford.*" It is the strongest, best, and is now made in three sizes as follows: PRICE.
No. 0, holding from 0 to ¼ inch $6.00
No. 1, " " 0 to ⅜ " 7.00
No. 2, " " 0 to ½ " 8.00
Send for catalogue of chucks of every size and description to
The Cushman Chuck Co., Hartford, Conn.

SAWS Wanted 50,000 Sawyers and Lumbermen to send us their full address for a copy of Emerson's ☞ Book of SAWS. We are first to introduce NATURAL GAS for heating and tempering Saws with wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address
EMERSON, SMITH & CO. (Ltd.), Beaver Falls, Pa.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

Steam! Steam!

We build Automatic Engines from 2 to 200 H. P., equal to anything in market.
A Large Lot of 2, 3 and 4-H. Engines With or without boilers, **low for cash.**
B. W. PAYNE & SONS,
Box 15, Elmira, N. Y.

STEAM PUMPS for Hot or Cold, Fresh or Salt Water; for Oils, Naphtha, Tar; for Cane Juice, Liquors, Syrups, Scum; for Ammonia, Alkalies, Extracts, Acids; for Thick, Volatile, Viscous or Foul Liquids, etc. Vacuum Pumps of the highest efficiency. Filter Press Pumps. Air, Gas and Acid Blowers. Air Compressors. Etc.
BUILT BY GUILD & GARRISON, Brooklyn, N. Y.

MAGIC LANTERNS

And STEREOPTICONS, all prices. Views illustrating every subject for PUBLIC EXHIBITIONS, etc. ☞ A *profitable business for a man with small capital.* Also Lanterns for Home Amusement. 152 page Catalogue *free.*
McALLISTER, Optician, 49 Nassau St., N. Y.

A PRACTICAL SUCCESS.
VAN DUZEN'S PAT. LOOSE PULLEY OILER.
Thousands in satisfactory every-day use. Entire reliability and constancy demonstrated in a two years' test by (would be) Eastern skeptics. Economy shown by reasonable prices and perfect performance. Send for our "Catalogue No. 55."
VAN DUZEN & TIFT, Cincinnati, O

SHAFTING DEPARTMENT Couplings, Hangers, Shafting, Pulleys.
SEND FOR CATALOGUE.
EDISON MACHINE WORKS. Salesroom 19 DEY STREET New York.

RUBBER BELTING, PACKING, HOSE,
AND ALL OTHER KINDS OF
RUBBER GOODS,
—FOR—
MECHANICAL and MANUFACTURING PURPOSES.
The Largest and Most Extensive Manufacturers in America.
THE GUTTA PERCHA AND RUBBER MFG. CO.
New York, Chicago, San Francisco, Toronto.

DROP FORGINGS.
FINISHED TOOLS
BILLINGS & SPENCER Co.

PATENT RIGHTS FOR SALE.
APPARATUS FOR BUILDING
CONCRETE BUILDINGS AND WALLS.

County Rights, $50. State Rights, $500.
See descriptive notice in SCI. AMERICAN, May 22, 1886.
Send for circulars. Ransome, 402 Montgomery St., S.F.Cal.

ESTABLISHED HALF A CENTURY.

MARVIN'S
FIRE & BURGLAR
SAFES
HAVE MANY PATENTED IMPROVEMENTS NOT FOUND IN OTHER MAKES THAT WILL WELL REPAY AN
INVESTIGATION
BY THOSE WHO DESIRE TO SECURE
THE BEST SAFE
MARVIN SAFE CO.
NEW YORK, PHILADELPHIA, LONDON. ENGLAND.

PRICE REDUCED.

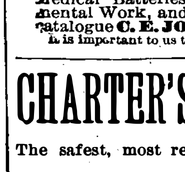
FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS, ETC.
Samples and descriptive Price List free by mail.
H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.

Telegraph and Electrical SUPPLIES

Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**
It is important to us that you mention this paper.

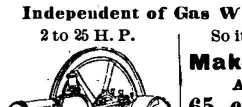
CHARTER'S GAS ENGINE.

The safest, most reliable and economical Motor in existence.
Independent of Gas Works and Machines.
2 to 25 H. P. So it can be used *anywhere.*



Makes its Own Gas AT COST OF ABOUT **65 cents per M Feet.**
A Saving of 25 to 85 per cent guaranteed over all other Gas Engines.
Chicago Agent: H. H. LATHAM, 42 Dearborn Street.
New York House: 12 Cortlandt Street.

Williams & Orton Mfg. Co.
P. O. Box 148. STERLING, ILL.



GEO. W. MARBLE, Sole Manufacturer of THE ACME WRENCH.
The best made, all steel, and warranted, 8 sizes.
28 to 32 South Canal Street, Chicago, U. S. A.

THE AMERICAN BELL TELEPHONE CO.
95 MILK ST. BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

BARREL MACHINERY. E. & B. HOLMES, BUFFALO, N. Y.

PROSPECTUS
OF THE
Scientific American
FOR 1887.
The Most Popular Scientific Paper in the World.

Only $3.00 a Year, including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It promotes knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.00 each; additional copies at same proportionate rate.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway, New York.

THE
Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information pertaining to these and allied subjects is given, the whole profusely illustrated with engravings.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are represented and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Address and remit by postal order, express money order, or check,
MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal or express money order, or draft to order of
MUNN & CO., 361 Broadway, New York.

HARRISON CONVEYOR!
For Handling **Grain, Coal, Sand, Clay, TanBark, Cinders, Ores, Seeds, &c.**
Send for Circulars. | **BORDEN, SELLECK & CO.,** { Sole Manu'f'ers, } **Chicago, Ill.**

Shafting and Gearing, Textile Machinery, ELEVATORS, ETC. | **THOS. WOOD & CO.** 22d and Wood Sts., Philadelphia, Pa.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.